NATURAL RESOURCE ACCOUNTING FOR THE OBLAST OF YAROSLAVL IN THE RUSSIAN FEDERATION

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1. INTRODUCTION

1.1 Background

The management of natural resources through a system of environmental accounts is a major development in many countries. The need for consistent accounts which allow international comparisons has prompted the Statistical Office of the United Nations to prepare a set of guidelines on the preparation of such accounts. These are known as the System of Environmental Economic Accounting (SEEA) and are available through a publication called the *UN Handbook on Integrated Environmental and Economic Accounting* (1993). The UN guidelines (and others which are similar) are being used in a number of countries in preparing environmental accounts, both at the monetary and non-monetary level. These include Brazil, Canada, Costa Rica, France, Germany, the Netherlands, and Norway. Some attempts at adjusting national income accounts for environmental effects has also been undertaken in Australia, Japan, India, Indonesia, Mexico, New Zealand, Papua New Guinea, Sweden, the United Kingdom, the United States, and Zimbabwe (Markandya, 1996).

The international experience in this area is relevant to the Russian Federation, which is endowed with a huge stock of natural resources of global significance. At the same time, the scale of use of these resources is also vast, as are the environmental impacts and damages. In the past, the use of these resources was not always governed by prices or considerations of scarcity. As Russia moves to a market based economy, the correct valuation of these resources will play a critical part in determining how they are used.

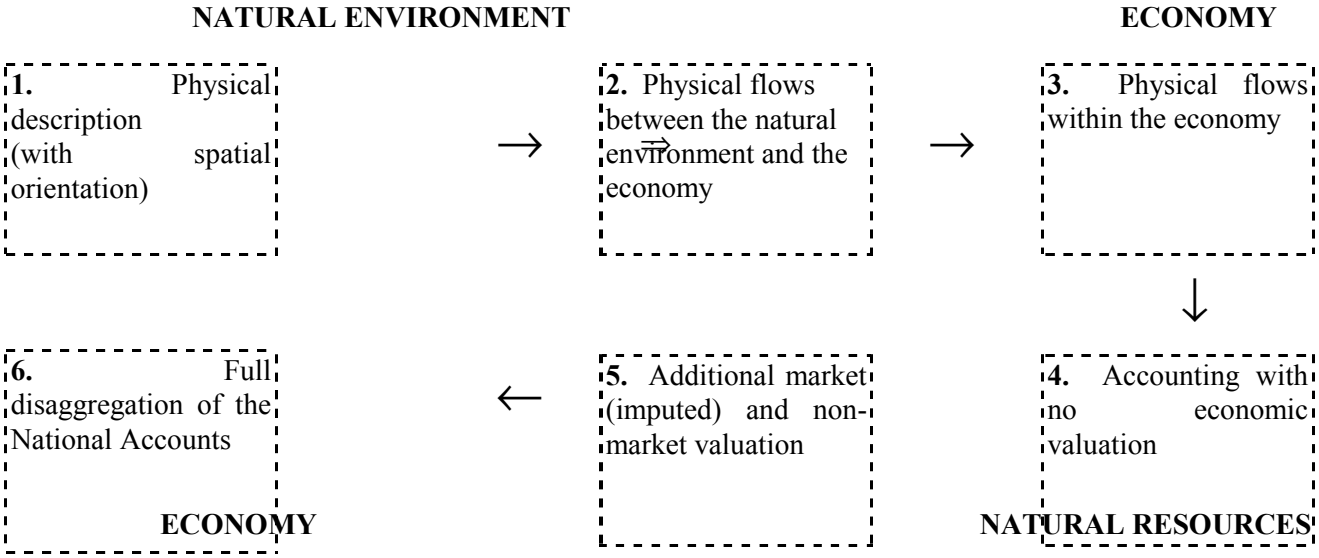
In this context, the *Complex Territorial Cadastre of Natural Resources* (Interim Guidelines, 1994), that has been prepared in draft form is being implemented by 35 subjects of the Federation, under an experiment supported by the Ministry of Environmental Protection and Natural resources. This cadastre will provide the essential data for the full physical documentation of these resources, as well as the basis for their valuation within the framework of regional and, ultimately, national SEEAs. The present program is collecting data on the following resources: sub-surface (mineral) resources, surface water resources, forest resources, hydro-biological resources, wild animal resources, and wild plants and mushrooms, as well as rare and endangered species, climate resources, integrated environmental assessment of a territory, and natural objects of recreational and cultural/historical significance.

1.2 The International Debate on SEEA

There are a number of approaches in the design of statistical systems describing the interrelationships between the natural environment and the economy (United Nations, Economic Commission for Europe, 1991a). Two extreme positions can be identified. On the one hand, there is the statistical description that focuses on the natural environment. Environmental-economic linkages are described with regard to impacts on the environment. Much of the statistical framework is concentrated on the spatial description of the natural environment, involving the use, for instance, of maps of particular regions (ecosystems or eco-zones). The information is normally presented in physical units. At the other extreme, some statistical frameworks focus on the economy and take environmental-economic linkages into account only in so far as they are connected with actual economic transactions (for example, environmental protection expenditures and actual damage costs). These data systems are more closely related to the conventional national accounts, as they present monetary data on actual transactions in market values.

In Figure 1 these two concepts – physical data collection and monetary accounting – are indicated in boxes 1 and 6. Approaches that are located between these two extremes could be classified with regard to the extent to which they incorporate monetary values.

Figure 1: Data Sources for Integrated Environmental and Economic Accounting



Distinction Between Accounting Systems:

1	Environmental statistics in the narrow sense
1+2	Natural resource accounts and environment in a broader sense
2+3	Materials and energy balances
5+6	Extended accounting systems
1+2+3+5+6	Satellite systems of integrated environmental and economic accounting (e.g. UN SEEA)

Source: United Nations (1993)

Systems that mainly use physical units could extend the description of the natural environment to include information on the physical flows between the environment and the economy (use of natural resources, flow of residual products). The existing systems of natural resource accounting and environment statistics comprise such data (Figure 1, boxes 1 and 2). This description in physical terms could be further extended to include information on transformation processes within the economy. Material/energy balances comprise a physical description of the use of natural resources, their transformation by production and consumption activities, and the flow of residuals back to the natural environment (Figure 1, boxes 2 and 3). Natural resource accounting and material/energy balances overlap, especially with regard to flows between the economy and the environment (Figure 1, box 2).

The description of economic activities in monetary terms has been extended in the case of the SEEA to the valuation of the use of the natural environment. Different methods are discussed below. The comprehensive measurement of costs and benefits of economic activities and their environmental impacts is the purpose of such calculations (Figure 1, boxes 5 and 6) (see, for example, Bartelmus, Stahmer and van Tongeren, 1991). Such valuation not only facilitates the incorporation of environmental concerns into economic analysis but also creates a common scale of measurement that allows the compilation of economic-environmental aggregates on a highly condensed level.

The SEEA thus covers in principle both national accounts describing economic activities and environmental accounts including all monetary and physical flows that describe the interrelationship between the environment and the economy (Figure 1, boxes 1, 2, 3, 5, and 6). This ideal concept cannot be fully realized at present, since comprehensive data systems for describing the natural environment and its interaction with the economy are still missing. Some ambitious approaches have been advanced in several countries, but no overall description of the natural environment has been realized so far.

This is not only due to inadequate financial support. While it is true that additional financial resources would have probably brought about more success in developing comprehensive statistical systems in the field of environment, the main reasons for the absence of comprehensive environmental accounting are the difficulties in describing the natural environment, with its climatic, biological, physical, and chemical changes, within a generic model of complex interrelationships. To date, most environmental assessments describe the state of the natural environment at a certain point in time. In general, except for selected regional case-studies, it has been impossible to portray fully the dynamics of natural processes. A complete integration of existing environmental and economic data systems seems, therefore, to be still an elusive objective.

1.3 Scope of This Exercise

In view of the above, we conclude that it would be useful to construct a set of environmental accounts for Russia, based on the SEEA guidelines. Given the importance of natural resources in the Russian economy, and the fact that existing methods of valuing those resources are imperfect, we believe the exercise should be extended, to the maximum extent possible, to include a proper monetary valuation of the resources.

The task of preparing such accounts for the Russia Federation is an awesome one, given the size and complexity of the country. One could take a 'top down' approach, assessing physical resources in some aggregate terms and then valuing them at the same level. Such aggregates, however, are unlikely to be of much use. They will mask important regional differences and will be of little value in aiding policy, which is the main purpose of the whole exercise. Consequently, we feel that the goal of preparing environmental accounts at the national level has to proceed from the 'bottom up.' Detailed estimates of physical resources have to be made at the regional level, which then have to be extended into monetary valuation. From these building blocks a national picture that will be useful in policy terms will eventually emerge.

This project is a step in that direction. The goals have been the following:

To use the data collected in the cadastre to prepare an accurate estimate of the physical stocks of natural resources in Yaroslavl Oblast and of their use over time, and in particular to see if use patterns are sustainable or not.

To prepare monetary estimates of the rates of use of natural resources, the values being based not on official 'prices' but on market values and on values as expressions of individual preferences for the use of these resources.

To use the data on valuation to examine possible changes in the role of natural resources as sources of tax revenue to the oblast and other tax authorities that obtain income from the taxation of natural resources.

The work has been undertaken jointly by the Administration of Yaroslavl Oblast and the Harvard Institute for International Development (HIID), under a Cooperative Agreement funded by the United States Agency for International Development (USAID).

1.4 Structure of This Report

This report is structured as follows:

Section 2 describes the natural resources of Yaroslavl Oblast, concentrating on those that have anthropogenic value, and focusing on the implications of past and present use of the resources for the

sustainability of the regional economy and society.
Section 3 looks at methods for the valuation of the resources in money terms. It is not intended as a comprehensive discussion of the methods, but as a presentation of the underlying issues and the ways in which such valuations differ from the ones used to assess the tax potential for the resources.
Section 4 reports on the valuation of two natural resources for one selected district in Yaroslavl Oblast; the resources are water and forests and the district is Danilov.
Section 5 discusses the potential role for natural resources in the public finance of the province. In particular, what do the valuation exercises tell us about how efficiently the resources are taxed and what changes are needed to increase the effectiveness of the tax system?
Section 6 concludes the report with a number of recommendations, including those for further work.

2. YAROSLAVL OBLAST

2.1 General Description of the Region

The territory of Yaroslavl Oblast covers 36,400 km^2 and is located in the most inhabited and economically advanced part of European territory of Russia in the basin of the Upper Volga. There are 11 towns in the territory including 6 of province subordination and 11 urban settlements. The territory of region is divided into 17 municipal districts and 226 administrative territories. Average density of the population is 40 persons per km^2. The center of the region is Yaroslavl, which is 282 km north-east of Moscow.

2.1.1 Demographic Data

The population of Yaroslavl Oblast was 1,456,000 at the beginning of 1995, of whom 1,176,000 (80.5 percent) live in cities (including 629,000 in Yaroslavl and 248,000 in Rybinsk). The working age (under 18) population makes up 19.8 percent of the total, 3 percentage points greater than in the Russian Federation as a whole. The number of unemployed in the region has been growing consistently. At the beginning of 1995 the unemployment rate was 7.9 percent; today it is 2 percentage points greater.

Since 1990 the population of Yaroslavl Oblast has been constantly declining: (-11.1 people per thousand inhabitants, from 1990 - 1995). This has been largely caused by a reduction in the birth rate. In 1985 there were 14.1 births per 1000 inhabitants, but by the beginning of 1995 there were only 7.8.

2.1.2 Socioeconomic Data

The region is characterized by relatively low income. Per capita income in 1995 was 2,288,000 rubles per annum ($460) with a significant number at levels of income well below that (around 11 percent of households are classified as poor). The population spend more than 68.7 percent of their income on the purchase of goods and payment of services, including 43.9 percent on food.

By the end of 1994, the living area per person in Yaroslavl Oblast was 19 m^2. Sixty-three percent of housing had hot water, 72 percent had sewage, and 68 percent had baths.

2.1.3 Economic Performance

The total income in the oblast as of January 1, 1994 amounted to 1,402,816 mln rubles ($280 mln). The main areas of activity are manufacturing, agriculture, services, and natural resources.

The value of industrial output in Yaroslavl Oblast was 11,838 billion rubles ($2.4 mln) in 1995. Table

2.1 shows what industrial production consisted of. As can be seen by comparing the regional income and the value of industrial output, a large part of industrial value goes outside the region (e.g. payments for oil extraction).

Table 2.1 Industrial Production in Yaroslavl Oblast in 1995

Industry	**1995**	**Percentage of 1994 production**
Crude oil processing, mln. tons	9.6	92
Auto tires, thousand items	2,741	117
Flaxen and jute fabrics, mln. sq. m	7,618	97
Watches	2,496	77
Meat and meat products, thousand tons	14.2	85

The structure of manufacturing in the regional economy is severely distorted at the present time. A large part of the industry, the major employer for the rural population in the province, is organized in big labor intensive enterprises which make mainly semi-manufactured products. Several large producers make finished products such as diesel engines, electronic parts for which demand has been lately dwindling. There are a few large producers ("Autodiesel," "Topaz," "Rybinsk motors," and Yaroslavl Radioplant being the major ones) that are engaged in activities for which demand has been collapsing. Hence they have reduced their output to about 20-30 percent of its 1992 level. At the same time, however, there are a few areas where production has remained buoyant; in particular, technical rubber products and tires, milling, and confectionery.

There is a general recession in agriculture and agro-processing industries. This is attributed to the sharp increases in the price of energy which have hit these sectors hard without restructuring agriculture. Basic data on agriculture in Yaroslavl Oblast is shown in Table 2.2. It should be noted that output is seen to be still falling, even though the 1994 levels were well below the levels prior to the start of the free market reforms in the Russian Federation.

Table 2.2 General Data on Agriculture in Yaroslavl Oblast

Agricultural produce come from three types of enterprises: agricultural processing facilities, private land plots, and farmers. The total output of the farmer enterprises remains rather low—1.1% of total agricultural output, while private family plots produce 40%. The average size of the land area in farmer enterprises is 23 ha (as of January 1, 1995).

Production directly connected with the use of natural resource potential is rather insignificant as can be seen from Table 2.3. In the monetary economy, wood and minerals account for only 0.25 percent of regional income. This is an underestimate, however, as much of the use of the natural economy is not recorded in the statistics (such as illegal cutting of wood and use of wood, water, non-timber forest resources, etc. with payment). We return to the use of natural resources later in this report. It is worth noting, however, that there has been a long-term decline in the integration of natural resources into the

economy of the region. In the 19th century, for example, the local economy was much more tied to the use of local raw materials such as flax and porcelain.

Table 2.3 Share of Economic Sectors Based on the Use of Natural Resources in the Income of Yaroslavl Oblast (Percent)

Sector	1990, percent	1991, percent	1992, percent	1993, percent
Agriculture	7	9.6	3.5	3.3
Forest sector	0.13	0.14	0.15	0.17
Geological surveys and prospecting of mineral resources	0	0	0.1	0.09

2.2 Description of Natural Resources in Yaroslavl Oblast

2.2.1 Water

Yaroslavl oblast has significant water resources. It has 4,327 rivers with a total length of 1,340 km, and 83 lakes, including two large ones: Nero in the Rostov district (an area of 54.4 km^2 and volume of 77.5 million m^3) and Plestcheevo in the Pereslavl district (an area of 50.8 km^2 and volume of 559 million m^3). The largest river is the Volga, which extends over 340 km in the region. The dams built on it have made it practically a circuit of reservoirs: Uglich (capacity 1,245 km^3), Rybinsk (25,420 km^3), and Gorky (8,815 km^3).

The annual drainage of the rivers in Yaroslavl oblast is 38.8 km^3, 30.6 km^3 into the adjoining Tver and Vologda regions and 8.2 km^3 on territory of the region itself. Total geological reserves of fresh waters in the region total 254 km^3. The volume of water in the rivers changes insignificantly. There are some important regional variations in the availability of water; the Northeast of the region has a poorer supply. In particular the areas of the Borisogleb Hills and Rostov Bottom are poorly supplied by water.

Yaroslavl Oblast has rather large sub-soil resources of fresh waters (springs etc.). Supplies available are 1002 thousand m^3 per day (365.6 million m^3 per year). These figures are, however, tentative, as only 19 percent of such supplies have been fully evaluated. The annual withdrawal of water from all sources is around 427 million cubic meters, of which about 7 percent comes from sub-soil sources (about 30 million m^3). Hence these subsoil sources are being exploited with a large margin of spare capacity. The annual extraction rate of underground waters is around 24 million m^3 a year. This is a tiny percentage of the total geological resources (254 billion m^3) and, taking the region as a whole, water use should be considered as being consistent with the goals of sustainability. The difficulties, such as they are, will arise at the local level. For example, Eastern and southern parts of the region are better supplied with water. We see some of these problems when we examine the situation in one region of Yaroslavl, namely Danilov. Table 2.4 gives a description of the water resources in Yaroslavl.

Table 2.4 Use of Water Resources in Yaroslavl Oblast

Parameters	Units	1980	1990	1994	1995	1995 value as percent of 1994
Average drainage	Million m^3/year	38.76	38.76	38.76	38.76	-
Stocks (recoverable) of subsoil waters	Million m^3/year	365.0	365.0	365.0	365.0	-
Water draw-off from natural sources	Million m^3/year	471.0	505.2	436.5	427.7	97.9
Total water used	Million m^3/year	465.3	485.0	408.4	399.9	98.0
Including						
Industrial purposes	Million m^3/year	331.9	295.0	212.2	207.4	97.7
Household purposes	Million m^3/year	133.4	185.0	178.0	130.7	73.4
Discharge of waste waters to natural water reservoirs	Million m^3/year	451.1	465.0	369.1	361.8	98.0

2.2.2 Minerals, Fuel and Energy Resources

Practically all useful minerals (except mineral water) in Yaroslavl Oblast lie in a tectonic depression. The minerals are sand, gravel, *keramitovim* , clay for bricks, peat and sapropel. There are some deposits of petroleum and ongoing prospecting has revealed deposits of gas.

2.2.2.1 Peat

More than 1020 deposits have been identified, occupying about 4 percent of territory of the region with stocks about 367 million tons, of which about 228 million tons are commercially viable. Peat stocks are located non-uniformly. The greatest concentration of them is in Nekous, Rybinsk, Yaroslavl and Pereslavl districts. Insignificant stocks of peat (about 1 percent) lie in Poshehon, Liubim and Danilov districts. Some large peat deposits of the region (Solodikha, Bolshoye, Nagorievskoye, Pyhanskoye and others) lie in areas declared as natural monuments and are not available for development. It is necessary to note, that because of the present economic difficulties, industrial production of peat on the territory of Yaroslavl Oblast has practically stopped. At the moment a package of measures to subsidize the production of peat for use as fertilizer is being developed in the region.

2.2.2.2 Sapropel

The large stocks of Sapropel are concentrated in Lake Nero - about 250 million. tons. Another 50 lakes taken together contain more than 500 million tons. A joint-stock company “Sapropel Nero” has constructed a plant for the processing of sapropel into the various forms of fertilizers.

2.2.2.3 Building materials

Building materials are generally concentrated, in Rostov (gravel, sand-gravel mixture), Yaroslavl and Rybinsk districts. 28 deposits of sand-gravel mixture have been evaluated. Together the stocks contained in them make more than 237,570 thousand m^3. There are 21 deposits of sand with more than 54,760 thousand m^3. In addition to these established reserves, possible reserves of these materials include: (a) more than 40 medium-sized deposits of sand-gravel mixture with about 14,360 thousand m^3; and (b) 11 deposits of sand with about 8,200 thousand m^3. The established stocks of non-mining materials deposits in Yaroslavl Oblast were estimated at 247,669 thousand m^3 in 1995. These have increased in comparison to 01.01.87 when they were 192,219 thousand m^3.

2.2.2.4 Mineral water

Significant stocks of mineral water of various compositions have been established in Yaroslavl Oblast.

There are a number of medicinal-restaurants and "Balneologicheski" or sanitoria. More than 30 operational springs have been drilled and are in production. The Sanitarium "Bolshie Soli" in the settlement Nekrasovskoe is established on the basis of mineral sources. The medical sources of sanitarium-preventorium "Stroitel" are said to be beneficial to health, including rheumatism and various nervous system diseases. Mineral water "Uglicheskaya" has great popularity in the region. In 1990, it produced 8,500 thousand of half liter bottles. Even today, despite the crisis the water continues to be produced at about that rate. The productivity of the Uglicheskaya source of mineral water is 300 m^3 a day. Payments for mineral water are raised on the basis of the blanket tariffs for draw-off of water from subsoil sources and are not differentiated. This may be an area where increased revenues could be realized for the budget; it is discussed further in section 4.

2.2.3 Forest Timber Resources

Yaroslavl Oblast is located in a forest zone. Its Northern part contains the Western region of "Taeshnochvoinich" woods, and the Southern part is in the Northwest region of coniferous and broad-leafed woods of Russia. The total forest area of Yaroslavl (from data of the account of wood fund on 01.01.93) was 1,807 thousand hectares. This included the following administrative categories and was divided in the following way:

Under the Administration of the State Forestry Service - SFS – 971.4 thousand hectares.
Collective farms, state farms and agricultural units – 682.3 thousand hectares.
Darvin reserve – 30.1 thousand hectares.
Pereslavl state hunting forest reserve – 59.2 thousand hectares.
Other – 64.3 thousand hectares.

Forest areas account for 47 percent of the territory of the region. The main forest resource that has been inventoried is that under the State Forestry Service. Excluding some of the land under that organization that is allocated for special functions and that has no forest cover, the amount left is 851.9 thousand hectares. This is broken down by species and by age as shown in Table 2.5.

Table 2.5 State Forestry Service Lands by Type and by Age of Trees

	Area (000 hectares)	**Total** (000 hectares)
Softwood		518.1
Birch	363.8	
Aspen	127.8	
Other	26.5	
Coniferous		332.1
Pine	114.6	
Fir	217.1	
Larch	0.4	
Age of Stock		
Sapling	193.7	
Young	181.4	
Middle	296.4	
Ready for Felling	180.4	

The amount of wood in the SFS that could be felled amounted to 1689 m^3, of which 404 thousand m^3 was coniferous. In 1995 actual amount felled was 527 thousand m^3 (31.2 percent); in 1994 it was 501 m^3

(29.6 percent)[1]. Of total felling, that undertaken in the coniferous sector was 177 thousand m^3 (43.8 percent) in 1995 and 151 thousand m^3 in 1994 (41.1 percent).

In the agricultural woodlands, available felling area was 472 thousand m^3; of this 136 thousand m^3 (28.8 percent of calculated felling area) were felled in 1995, including 32 thousand m^3 (34 percent) of coniferous forest. Data on use amounts available for cutting and amounts cut are given in Table 2.6 below. The available cut has been declining slightly (for softwoods), but actual amounts cut have almost halved over the period 1991 to 1995. Thus, this particular natural resource is being underutilized, at an increasing rate.

In assessing the sustainability of the cutting, we note that present rates are well below sustainable yields. However, other factors need to be taken into account. First there are forest fires. There were 57 wood fires affecting an area of 59.4 hectares in 1995; in 1994 there were 5 fires affecting an area of 10.2 hectares. Thus, although the forests have caused some damage, they have not had a major impact on available timber resources.

Table 2.6 Felling Areas and Amounts Felled, 1991 - 1995

Parameters	**Units of measurement**	**1991**	**1992**	**1993**	**1994**	**1995**
Available felling area	thousand m^3	1868	1868	1868	1868	1689
Amount of coniferous	thousand m^3	403	403	403	403	404
Amount felled	thousand m^3	1010	994	743	501	527
Amount of coniferous	thousand m^3	221	233	217	151	177

Second, there are issues relating to forest health. The team carrying out the study reported that sanitary condition of woods in the region is satisfactory. Large centers of wood illnesses and pests are not found and the situation is not worsening in this respect.

Third is the question of expenditures on replanting and overall maintenance. On both of these, expenditures have been declining and areas replanted have been falling. This will impact on future available felling. In addition, some of the practices used in felling and lumber work are environmentally damaging and are having a serious negative impact on the forest cover and on saplings. Felling areas are unsatisfactorily cleared. Again, these practices will have negative long term impacts that are not consistent with the goals of sustainability.

Finally there are other environmental changes that impact on forests. In this regard, water management in the Gorky reservoir is important. The water levels of the groundwater in the neighborhood have risen so much that the Eastern part of the region has become boggy and about 3 thousand hectares of woods have partially perished. Another environmental impact that should be recorded is that associated with climatic changes related to the creation of the Rybinsk reservoir. As a result of this, the conditions for the renewal of woods in the Northwest of the region have deteriorated.

There is no overall review of the impacts of all these changes in the use and regeneration of forest resources in Yaroslavl Oblast. From a superficial view, however, it appears that forest timber resources are being significantly underutilized in the short run and not enough is being spent to protect and maintain the resource in the long run. The difficulties in both cases emanate from the economic crises in the region and the country. These have caused a decline in the demand for timber and a decline in the budgetary resources available for forest management and protection.

[1] In addition to the above, the SWF undertook felling of 54.9 thousand M^3 for maintenance and sanitary purposes.

2.2.4 Forest Non-timber Resources

The forests of the region have some valuable vegetative resources besides wood: mushrooms, berries, medicinal and other genetic materials. Wild flora of the region number about 1130 species of plants, 252 kinds of them are taxonomically classified, 63 kinds need special protection and 9 are listed in the Red Book of Russia (a list of internationally recognized endangered species).

Bog vegetation occupies an essential place in the vegetative cover. There are 95.6 thousand hectares of bog land in the region, containing about 90 rare species, among which are relics of the precise age and valuable modern age plants. About 230 species of medicinal plants grow in the region. Estimates of stock have been made for more than 20 species of plants. These show that the stocks of valerian, St. John's wort, highlander green, juniper, and cow berries have been falling in recent years.

Other vegetative resources of the region are poorly investigated. There is minimal information on meadows, wood grassy circle, grasses and undergrowth, water and shore vegetation. There are no data on flora of cultivated landscapes, fields or near road strips. There is practically no data about household groups of wild plants (food, fodder, honey-bearing plants and others), by which it is possible to judge the resource potential of the region.

The above picture indicates the need to build up a much more complete inventory and taxonomy of the non-timber resource base, so that it can be better used to assess and implement sustainable exploitation rules and design better systems of tax collection.

2.2.5 Land Resources

The land cadastre of 01.01.96 showed land area of the region of 3617.8 thousand hectares. The structure of the land resources is given in Table 2.7.

Table 2.7 Land-use Patterns

Type of Land	**Thousands of hectares**	**Percent of the total area**
Agricultural lands (total)	1151.8	32
Lands, in stage of reclamation construction and restoration of fertility	0.74	<0.1
Wood areas	1706.4	47.2
Wood-undergrowth plantations not included in the wood fund	90.8	2.5
Bogs	107.3	3.0
Water-covered lands	386.1	10.7
Squares, streets, lanes, embankments, roads, runs	88.6	2.4
Parks, gardens, botanic gardens, parkways	1.6	< 0.1
Built up territories	30.6	0.8
Degraded soils	16.0	0.4
Other lands	37.0	1.0
Total area	**3617.8**	**100.0**

Since 1990 area under plough has been reduced by 12 thousand hectares, hay-making land by 11.8 thousand hectares, and pasture areas have been increased by 14.2 thousand hectares. Soil fertility in the region is low. Humus is around 2 percent on the average, the soils are of low acidity on average, and areas suffering from waterlogging are great.

Agricultural lands make up 1151.7 thousand hectares or 32 percent of total land. 801.1 thousand hectares, or 69.5 percent, of arable lands, 225 thousand hectares (20 percent) are pasture and 109.4 thousand hectares or 9 percent are used for hay-making. Distribution of the land by users is given in Table 2.8.

Table 2.8 Distribution of Land Users as of 1 January, 1996

Users of ground	**Quantity**	**Area (thousand hectares)**	**Agricultural lands (thousand hectares)**		
			Total	including plow land	haymaking pasture
Associations of farmers enterprises	2	0.65	0.6	0.56	0.04
Collective farms, including collective fisheries	101	551.3	260.6	198.4	62.2
Agricultural production cooperatives	70	300.4	144.0	112.1	31.9
Joint-stock companies	190	810.7	455.2	339.3	115.9
State and municipal enterprises	18	58.9	39.3	31.5	7.8
Subsidiary agricultural enterprises	53`	40.8	20.1	15.6	4.5
Agricultural scientific and educational institutions	25	20.2	15.8	11.8	4.0
Other enterprises and organizations	134	29.4	14.7	10.7	4.0
Privately owned land	n.a.	64.3	54.6	33.1	21.5
Total (lands of agricultural enterprises, organizations and citizens)	n.a.	1876.6	1004.9	753.1	251.8
Lands of municipal, village and district authorities	n.a.	191.4	119.5	35.8	83.7
Lands of industry, road communication, broadcasting and other importance	n.a.	57.1	2.7	0.4	2.3
Lands of nature protected territories	n.a.	37.8	0.4	-	0.4
Water services land	34	1018.1	8.0	0.8	7.2
Water services land	n.a.	370.7	0.1	-	0.1
Reserved (unused) land	n.a.	68.4	17.0	11.0	6.0
Total	n.a.	3620.1	1152.6	801.1	351.5
Total land within administrative borders of the region		3617.8	1151.7	801.1	350.6

n.a: Not applicable or available.

2.2.6 Animal Resources

The animal resources of Yaroslavl Oblast are typical for the Southern Taiga and for needle and broad-leafed forests. Representatives of 6 classes, 28 groups and 83 families of fauna live in the territory of the region. Among these are more than 260 species of birds, about 50 of mammals, 5 of reptiles, 10 of amphibians. In total there are 380 species of vertebrates. Eight species of birds hibernate on the territory of the region, about 200 nest here and 24 are birds of passage. Seven kinds of birds from the region are listed in the Red Book of the Russian Federation. The environmental committee of the region has prepared measures for the protection of endangered species, as required under the CITES convention.

Most of the land area of the region is given to hunting (3 million out of the 3.6 million hectares). About 63 species of animals and birds are hunted on these lands. Data on number of the basic species of hunting animals and changes in 1991-1995 years is submitted in Table 2.9. There are significant reductions in the numbers of several animals and in virtually no case is there an increase. Particularly large decreases are noted for wild boar, squirrel, and black cock.

Table 2.9 Number of the Basic Species of Hunted Animals (1991-1995), thousand heads

Species	**1991**	**1992**	**1993**	**1994**	**1995**HOOFED-ANIMALS
Elk	15.2	22.1	14.3	14.8	13.1
Deer	0.5	0.8	0.6	0.2	0.3
Wild boar	10.4	6.8	4.2	1.7	3.0FUR ANIMALS
Squirrel	45.9	31.6	40.6	33.8	19.2
Hare	38.6	44.4	33.9	35.1	33.4
Marten	2.3	2.5	2.1	1.6	1.1
Fox	4.4	7.1	4.0	3.7	3.8
Musk-rat	0.8	1.1	0.7	-	-
Beaver	3.2	4.3	3.5	3.3	3.4
Wolf	0.1	0.2	0.1	0.1	0.1
Bear	0.8	0.9	0.7	-	0.7BIRDS
Wood-grouse	7.9	7.7	3.4	-	7.3
Black-cock	41.4	41.9	-	-	27.0

Source: Data are from hunting economy management.

Laws governing hunting are established in accordance with data on species of animals. Account is taken of numbers of animals as well as demand for hunting licenses. Data on numbers of basic hunting animals shot for period 1991 - 1995 is submitted in Table 2.10. The teams have not analyzed whether the rates of hunting are contributing to the loss of species. This should be done in preparing the physical environmental accounts for the region

Table 2.10 Numbers of Basic Species of Animals Killed by Hunting (1991-1995)

Species	**1991**	**1992**	**1993**	**1994**	**1995**HOOFED ANIMALS
Total	5676	5935	4262	1895	2354
Elk	2795	3577	3143	1865	1982
Wild boar	2861	2306	1071	-	372FUR ANIMALS
Squirrel	8564	3836	1675	3645	-
Hare	4586	6170	5550	6809	12778
Marten	463	701	773	766	663
Red fox	167	232	167	342	501
Beaver	170	253	210	162	97
Wolf	105	151	173	151	105
Brown bear	84	70	67	61	53FEATHERED GAME
Wood-grouse	858	955	1106	-	4412
Black-cock	127	134	83	-	100
Ducks	55065	58554	41461	55429	71428
Geese	-	1130	368	1503	1140

Source: Data are from hunting economy management.

2.2.7 Fish Resources

The fish productivity of water bodies of Yaroslavl Oblast is low and makes about 5kg\hectare in the Rybinsk reservoir, and less than 3kg\hectare in the Gorky river. There is not enough data on fish productivity in the other rivers. There is no strong trend in the fish productivity of rivers in the region. Unfortunately there is no information on the catch rates and whether these are sustainable or not.

2.3 Major Data Gaps in Resource Information

This section has examined the physical information on natural resources in Yaroslavl Oblast. It has not discussed the payments made to the state for the use of these resources. That is left to the next section. The physical information at the regional level is a useful and important first step in the construction of physical and monetary environmental accounts, but there are still a number of gaps that need to be filled. Listed below are the major data deficiencies for each of the main resources:

2.3.1 Water

The data on water suggest that overall use is in accordance with sustainability considerations. However, the problems are likely to be local, and more information is needed on where the present rates of usage are likely to result in shortages and difficulties for future generations.

2.3.2 Minerals

Present rates of mineral use are small and could be maintained for long periods of time. Hence, the issue of depletion is not a major one. Indeed, for building materials the proven stocks have been increasing

with time. As with water, however, there may be areas of the region where present rates of use will exhaust supplies. These should be flagged in the environmental accounts. As a general guide to sustainable development, the administration should ensure that an amount equal to the depletion premium from the use of exhaustible resources is invested to provide additional capital for future generations. For most of the minerals in Yaroslavl Oblast this amount is insignificant at present (see Section 4 for details on how to calculate such a premium).

2.3.3 Forest Timber Resources

The extraction of forest resources has been declining and is well below the sustainable yields for the region as a whole. The data do not allow us, however, to see whether specific areas are being over-harvested. In addition, there are signs that forest management is being neglected, with expenditures on maintenance and replanting falling considerably in recent years. These will have long term impacts on sustainability that are unquantified but could be serious.

2.3.4 Forest Non-timber Resources

These are potentially significant and could be important to the regeneration of the economy of the region. The data on them are, however, very limited. What is available indicates that stocks of some commercially important species are declining. Hence, the most important task here is to build up a better inventory and to monitor extraction more accurately. In this way, the resource could contribute to economic reconstruction in the region and could provide revenues to the government.

2.3.5 Land Resources

The data on land resources is generally good and forms the basis for the taxation of land (see Section 3). There is little information on changes in fertility. It is difficult to collect, as overall productivity changes (from which it is inferred) are dependent on many factors. The exercise is worth carrying out, however, as it will reveal the areas where agricultural practices are unsustainable.

2.3.6 Animal Resources

The animal resources of the region are large and important to the environment and the economy. The decline in some key species is a bad sign, and indicates that past hunting and wildlife management has not pursued sustainable goals. Changes in hunting practices may be required to ensure that the resource is not over-harvested.

2.3.7 Fish Resources

The data on fish resources are extremely limited. More is need on catch rates and fish productivity to enable the administration to estimate the consistency of current practices.

3. THE TAXATION OF NATURAL RESOURCES

3.1 The Role of Natural Resources in Taxation in General

The taxation of natural resources has played an important part in the public finance of societies for a long time, beginning well before the development of advanced industrialized economies. As we see later in this section, Yaroslavl Oblast had a system of taxation prior to the 1917 revolution that was heavily dependent on the taxation of natural resources. Countries that have large amounts of natural resources see them as important sources of tax revenue. For example, if we compare three countries – the Russian Federation, the UK, and the US – the amounts of taxes collected by the mineral sector, both in absolute terms and as a percentage of the value of that sector, are given in Table 3.1 below.

Table 3.1 Taxation of Mineral Resources in Russia, the UK, and the US

Country	Value of Mineral Sector Output ($mln)	Taxes on Minerals ($mln)	Minerals Taxes as percent of Sector Output
Russian Federation	52,865	10,245	19
UK	38,557	22,684	59
USA	196,378	45,787	23

Source: Golub, Markandya, and Strukova (1995)

From the above, it can be seen that anything from 20 to 60 percent of the value of mineral output can be collected in taxation. Moreover this can be done without affecting the viability of the mineral production sector, which is an important and well functioning sector in the UK and the USA. The legal basis for such taxation is complicated. Part of the taxation of mineral output is justified on the same basis as all activities in the economy: that it is a contribution to revenue, based on 'ability to pay'. A second justification for taxation is based on the fact that the resources are owned by the state and hence the state may collect a rent from the extraction. Third, a tax may be levied on the grounds that the resource is being depleted and a fund should be set up to replace the lost natural capital with other forms of capital (man-made, human). This is referred to as the 'sustainable income basis of taxation'. Finally, taxes may be levied on mineral extraction because of the damages caused to the environment by the extraction process, that have to be made good out of public funds.

For renewable resources, taxes are levied on the extraction of timber resources, non-timber resources, fauna and flora for all of the above reasons, except possibly for the third reason, i.e. that the resource is being permanently depleted. If the resource is well managed it should be used sustainably, in which case no depletion tax is warranted. If, however, the resource is being mined, a depletion tax may be justified.

The taxation of rent is economically attractive because it provides a source of revenue without causing distortions in the economy and without creating negative incentives that reduce the effort put into resource exploitation. Since this tax is over and above the taxes imposed on natural resource based sectors (e.g. VAT, normal profit, employment tax etc.), it follows that natural resource extraction should bear higher rates of taxation than other sectors.

3.2 Natural Resource Taxation in Yaroslavl Oblast

As we noted earlier, natural resources have played a major part in the public finance of the region. Tables 3.2 show the structure of taxes in the pre-communist period. Over one-third of revenues in the provincial budgets came from payments for natural resource use (second table in 3.2). The natural resource payments came in the form of direct and indirect taxes and well as 'other revenues'. About 50 percent of all provincial direct taxes were derived from payments for natural resources and about 30 percent of indirect taxes and 'other revenues' consisted of natural resource payments. Thus payments for natural resources played a very significant part in the public finance of the region. Moreover, most of the income raised from such payments were kept in the region, with only around 2-3 percent going to the federal budget.

Of course the share of total taxes collected from natural resources depends on the share of the overall economy that is based on natural resources. We do not have this information for the pre-communist

period, although there are strong indications that it was quite large. For the more recent period, as we saw in Table 2.3, the share of total income of the region allocated to natural resources was as follows: agriculture (3.3 percent), forest (0.07 percent) and mineral resources (0.09 percent). Given this information it is extremely unlikely that natural resource taxation could play the kind of part it played in the pre-communist period. Nevertheless there is scope for enhancing the income from this sector, as we explain below. Before doing that, however, we look at the actual collection of taxes from natural resources in 1994 and 1995.

Table 3.2 Taxation of Natural Resources in Yaroslavl Oblast Pre-1917

Structure of revenues in the budget of Yaroslavl Oblast: 1903-1915

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
Total Revenues	18783	17905	19398	22796	20382	21690	20265	22131	24050	25196	27315	24845	-
Indirect Taxes (percent)	56.0	53.6	57.2	68.7	62.6	63.2	58.4	56.9	58.5	58.9	60.9	53.9	59.1
Direct Taxes (percent)	27.6	29.8	21.8	25.6	29.9	24.6	22.8	22.3	20.9	21.2	20.5	24.7	24.3
Other Revenues	16.4	16.6	21.0	5.7	7.5	12.2	18.9	20.9	20.5	19.9	18.5	21.4	16.5

Payments for natural resource use in Yaroslavl Oblast as percent of all revenues: 1903-1915

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
Central Govt. Budgets (*)	2.4	3.7	2.3	2.0	2.2	1.9	2.9	2.8	2.8	2.8	2.6	3.5	2.7
Provincial Budgets	32.3	36.5	-	35.7	36.3	36.8	38.3	35.9	34.2	35.0	31.5	31.5	34.9

(*) The figures are the percentage of taxes collected in Yaroslavl Oblast going to the central government, that are made up of payments for natural resource use.

Payments for national resources as percent of direct taxes in Yaroslavl Oblast: 1903-1914

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914
In Central Govt. Taxes	13.8	14.3	1.5	16.0	14.8	18.7	24.7	23.9	24.2	25.9	24.6	24.1
In Region Taxes	54.8	55.2	-	54.3	54.3	53.8	53.8	51.8	48.9	51.2	49.4	52.2

Table 3.3 presents the revenue of the budget. Approximately 2 percent of provincial revenues, 0.4 percent of federal revenues, and 4.2 percent of district revenues are derived from natural resources. At the same time, the share of the natural revenue going to the Federal budget has been increasing. It was 17 percent in 1995, which is also higher than it was in the pre-communist period (7-10 percent).

Table 3.3 Structure of Government Budget Revenues in Yaroslavl Oblast: 1994 -1995

Category	**1994**	**1995**
Total Revenues	1699.0 Bn. rubles	3497.8 Bn. rubles*Structure of Revenues (percent)*
Indirect Taxes	5.3	
Direct Taxes	87.4	
Other Sources	7.3	*Sources of Revenues (percent)*
Federal	47.3	48.4
Provincial (*oblast*)	14.9	14.2
City	23.5	23.6
Town/District	10.5	10.0
District	3.8	3.8*Revenues from Natural Resource Use (as percent of total revenues)*
Total Revenues	1.5	1.2
Federal	0.9	0.4
Provincial (*oblast*)	3.1	2.0
District	4.3	4.2*Allocations of Natural Resource Revenue (percent)*
Federal Budget	11.0	17.2
Provincial (*oblast*) Budget	23.4	24.4
City Budget	28.1	23.4
Towns/Districts	26.3	19.2
Districts	11.2	15.8

The main sources of natural resource income are given in Table 3.4. The absolute amounts of tax collected are small compared to the overall tax revenue. Within the overall classification of natural resource taxes, forestry taxes account for 3.3 percent, mineral taxes for 4.5 percent, land taxes for 74 percent and the rest for 18 percent (water taxes and other payments). It is interesting to compare the natural resource taxes' contribution to overall tax revenue and the corresponding contribution the sector to regional income. Table 3.5 provides the relevant data. Even though the contribution of these sectors to provincial income is small, their contribution to the taxes collected is even smaller. For forests it is 4 times as small, for minerals it is two times as small and for agriculture it is 4 times as small. That suggests that there is increased scope for taxes in these areas, even allowing for their small size. However, the true contribution of these sectors to the economy is underestimated. This is because much of the activity in forestry, and in other natural resource sectors such as non-timber collection, etc., is not documented in the monetary accounts. We believe that a proper documentation of these resources would indicate substantial value to these resources. The question of taxing them, however, is a difficult one, as those benefiting from the resource often do not have any money income. One way of getting around that is to take payment in kind; perhaps in time allocated to the management of the resource. This idea is discussed further in Section 5.

Table 3.4 Payments for the Use of Natural Resources in Yaroslavl Oblast (1993 -1995, actual prices)

Type of Payment	1993 (000 rubles)	1995 (000 rubles)	Change over period (percent)
Total Payments (excluding Ground Tax)	950,973	10,302,628	1083
Structure of Payments by Administrative Region			
Federal	694,239	2,419,580	349
Provincial	256,734	7,883,048	3070
Structure of Payments by Type of Natural Resource			
Extraction of sub-soil and under sea resources	83,746	2,306,174	2754
Water	57,742	683,246	1183
Forestry (general)	118,760	1,335,766	
Forestry tax (inc. deductions for replanting schemes)	328,389	n.a.	n.a.
Deductions for reproduction of mineral-raw base ??	124,525	1,783,550	1432
Other payments	237,811	4,193,892	1764
Total Ground Tax Payments (total)	2,810,182	29,753,811	1059
Structure of Payments by Administrative Region			
Federal	545,708	4,475,950	820
Provincial	2,264,474	25,277,861	1116
TOTAL PAYMENTS	3,761,155	40,056,439	1065

Table 3.5 Share of Natural Resources in Taxes and Income in Yaroslavl

Sector	Tax Collected from Sector (Million rubles)	Total Tax Revenue From All Sources (Million rubles)	Share of N.R. Tax in Total (percent)	Share of N.R. in Income (percent)
Forest	1356	3500	0.038	0.17
Minerals	124	3500	0.004	0.09
Agriculture	2810	3500	0.080	3.30

Sources: Other tables in this report.

Note: The share of NR in income is for 1993, whereas the share of NR in tax is for 1995. However, the comparison is broadly valid.

Table 3.6 looks at the allocation of tax revenues between different levels of government and the rates of taxes levied. There are a few points of interest that emerge from this table. First, and most important, the division of taxes is partly a political decision, rather than one taken purely on economic grounds. Many scarce natural resources are not taxed at all, such as fish and wildlife. The level and structure of taxes should reflect scarcity concerns rather than political ones.

Second, where the taxes are specifically designed to support expenditures on resource protection it is appropriate that the authority responsible for those expenditures should receive the tax revenue. The relationship between tax revenues and expenditures cannot be determined from Table 3.6, but it is unlikely, for example, that 100 percent of protective or mitigative expenditures for minerals and wood resource use are carried out by the municipal governments and that the share of expenditures for land protection between the regional and municipal authorities is in the ratio of 10:90.

Table 3.6 Allocation of Natural Resource Budgets in Yaroslavl Oblast (January 1996)

Type of Natural Resource	**Tax Rates**	**Distribution of payments (percent)**			**Notes**
		Federal	**Regional**	**Municipal**	*Subsoil Assets*
Any mineral extracted	2 - 4	-	-	100	Resolution No: 74. All minerals
Peat	3 - 6	-	-	100	that are classified as 'useful' are
Depletion Tax (all minerals)	5	-	100	-	taxed. Depletion tax set up under
Peat	3	-	100	-	Federal Law N0: 224 - 03
					Subsoil Waters
For Use	4 - 8	25	25	50	Resolution No: 331*Wood*
Depletion Tax	5	-	100	-	*Resources*
For Use	see notes	-	-	30	70 percent of revenues are given to forestry management centers in Danilov region. Minimum rates of tax are fixed under Resolution No: 18
Land Resources					
Agricultural land	see notes	-	10	90	Average rates of the land tax in municipal counties are set by the
Land in cities and other inhabited points	see notes	20	20	60	Law of the Yaroslavl region of 08.09.94. Indexation of these payments will be carried out annually.

Third, the actual tax rates are assessed in an unclear way. For water, the charge should be based on the long run marginal costs of supplying raw water to the water authority. These include the capital costs of the water system as well as any costs of resource depletion. An example of the latter would be a reduction in water levels in a river causing the authority to build up extra capacity elsewhere. The tax payable should also take account of any return flows which, if of similar quality to the abstracted water, mean that the authority is not really consuming the water. Another factor that is important is the timing of the abstraction. Water drawn in the summer months has more cost implications than water drawn in the winter months. Details of such pricing issues are discussed further in Section 4, but the point to note there is that the taxes as currently conceived do not take account of such economic criteria. The result is, typically, taxes that are too low. The same applies to forest charges for wood abstraction. The details are discussed in greater depth in later sections but at this point we note that the relationship between the tax rate and the 'rent' on timber is a weak one.

Fourth, the depletion tax is also determined in a way that is not consistent with economic principles. These are elaborated in Section 4 and, for most resources with lifetimes in excess of 30 years or so, the depletion premium would be negligible. Yet the rates in Yaroslavl are substantial for some resources. We note that the depletion tax has been withdrawn in the light of the economic conditions. Given the way it was derived this is probably the right decision. We are unable to comment on whether the

allocation of the depletion tax to the regional government is the right decision, as we have no information on how the tax is eventually spent. Ideally it should go to investments that replace the lost natural capital with man-made capital that will have an equal productivity by the time the natural resource has been fully depleted. These issues are discussed more fully in Section 4.

3.3 Environmental Pollution Taxes in Yaroslavl Oblast

Taxation is raised from any polluting enterprises in Yaroslavl Oblast, irrespective of the structure of ownership. Taxes are levied on airborne pollutants from both stationary and mobile sources, solid and liquid wastes. The revenues from pollution taxes are distributed among various ecological funds which are then used to mitigate environmental problems. Total emissions of air pollutants in Yaroslavl Oblast were 338,300 tons in 1995 with stationary sources accounting for 180,500 tons. These figures are down from 1994 levels. Total sewage emission is estimated at 357.87 mln. m^3 per year.

Resolution number 190 established the allowable limits for all types of pollution, with tax payments being imposed when these are exceeded. A further resolution grants exemption to firms involved in social and cultural business. Data on the source and level of tax payments is given in Table 3.7 and the distribution of taxes is given in Table 3.8. The level of tax payments in the region is periodically reviewed by a Commission of Ecology and Natural Resources created under resolution number 190.

Table 3.7 Structure of Environmental Pollution Taxes in Yaroslavl Oblast in 1995.

Pollution Sources	**Revenue Raised (000 rubles)**
Air pollution from stationary sources	1802.1
Air pollution from mobile sources	112.7
Emissions to water	1306.9
Solid waste emissions	1416.6
Total	4638.3

Table 3.8 Distribution of Revenues from Environmental Taxes (1995)

Pollution Source	**Distribution of Payments (percent)**			
	Federal budget	Non-budget and budget ecological funds		
		Federal	Regional	Municipal
Water	10	10	30	60
Atmospheric	10	10	30	60
Solid wastes	10	10	30	60

The main issue is the appropriate design of tax structures that provide the correct incentives for environmental protection. It is generally acknowledged that the present system of taxes has little in the way of incentive effects on the producers and that the structure is too complex. This was true at the time when the system was first introduced in the early 1990s[2], and is perhaps even more true now, when the real value of the charges has eroded and more exemptions are given. On the other hand, more enterprises paying the tax are in the private sector and therefore have some incentive to avoid paying the tax (in the public sector the tax can simply be passed on to the agency responsible for the financial management of the enterprise). The use of the revenues in earmarked funds that support ecological investments has been

[2] See Kozeltsev and Markandya, "Pollution Charges in Russia: The Experience of 1990-1995," in R. Bluffstone and B. Larsen (1997), *Controlling Pollution in Transition Economies*, Elgar, Cheltenham UK.

discussed elsewhere (see Bluffstone and Larson (op. cit.) and O'Riordan (1997)). It is our view that, at the present time in the Russian Federation, the earmarking of the taxes is desirable, but that the effectiveness of the investments supported by the ecological funds is extremely variable. Projects supported at the provincial and municipal level include land clearance projects, replanting schemes, research initiatives and general environmental protection. The efficiency of these investments in the sense of cost per objective achieved can and should be improved. The division of funds between federal, regional and municipal authorities appears to be based on political considerations rather than on a division of responsibilities that reflects the efficiency of different ecological investments handled by the different organs of government.

3.4 Conclusions

This section has reviewed the taxation of natural resources in Yaroslavl Oblast, in the context of the taxation of such resources in the Russian Federation. The main conclusions are:

Payments for use of natural resources do not at the moment play a significant role in formation of budgets of Yaroslavl Oblast and municipal counties. Although the scope for such taxes is limited by present economic circumstances, even taking this into account the taxes collected are less than the natural resource sector should pay.

Compared to past taxation of natural resources, the present levels are very low. Certainly prior to the 1917 revolution, natural resource taxes played a major part in the provincial budget (30-50 percent of all taxes came from this source) and very little was passed on to the federal government (around 2-3 percent). There is much to be said for increasing the share of natural resources in the present tax system.

The division of taxes between authorities and the levels of the taxes for natural resources seems to be determined more by political considerations than by economic ones. A greater role for economic principles in determining the tax structure, as discussed in this section, would improve the efficiency of taxation overall.

Unfortunately, the present federal legislation gives rather limited opportunities for the differentiation of payments for nature use at regional and local levels. Regional variations in the tax rates are important, because the impact on the environment of the use of resources in different areas varies. Allowing form more freedom in setting the rates would be beneficial and would improve the tax system.

Payments for use of a number of natural resources are not levied at all. For example. there are no payments for use of hunting and fish resources. The government should look at innovative ways to tax a wider range of resources. These should cover payments for gathering of vegetative raw material, and the extension of payments for hunting and gathering to areas outside those traditionally ones where licenses are required and fees levied. The government could also consider payment for the use of some recreational resources (at present only organized places of rest in grounds of the wood fund collect payments).

The taxes on environmental pollution are too low to have an incentive effect and generally to complex. The revenues collected are used with low efficiency in making ecological investments.

In the next section we look at ways in which the value of natural resources can be better assessed, so that their taxation can be made more effective.

4. VALUING NATURAL RESOURCES IN AN ENVIRONMENTAL ACCOUNTING FRAMEWORK

4.1 Introduction

This section provides some guidelines for the economic valuation of natural resources in Yaroslavl Oblast. It provides a methodology as well as some indications of likely values. Inevitably for the latter there are some gaps, but the numbers provided should give some indication of broad ranges for the values that can be expected. The resources covered are:

Water resources (drinking water, surface and sub-surface, agricultural use)
Forest resources (timber, hunting, fuelwood, non-timber products, including animals and plants)
Mineral resources, mainly gravel and sand.

The basic conceptual issue here is to treat natural resources in terms of their value to the oblast of Yaroslavl. There are a number of reasons why a proper valuation is desirable. First, we know that many of these resources are exploited in a way that results in the state and the residents not receiving the correct value from the exploitation; often there is an undervaluation in the market data on revenues generated by the resources and this undervaluation has to be corrected. Second, there are some resources that provide services that are not valued at all. For these an initial valuation is required. Third, some activities in the economy may be damaging the natural resource base. Such damages will impact on the present and future services that these resources can provide. Hence, they should also be valued as a negative impact. Finally, some resources are being depleted in a way that will result in future generations not having access to the same resource base. In such cases we need to make allowance for the depletion. To summarize then there are four types of valuation to be carried out:

Valuation of the commercial use of existing resource exploitation,
Estimation of the non-market use of natural resources,
Estimation of damages to the natural resource base,
Estimation of the depletion value of natural resources.

Each of the following is discussed further below.

4.2 Types of Valuation to be Carried Out

4.2.1 Valuation of the Commercial Use of Existing Resource Exploitation

Where existing resources such as water and timber are extracted and used, the user often does not pay the full value (or rent) of that resource. This value can be assessed by a method called ‘netback’, where we start with the value of the resource at the point of final use or the point of export from the oblast and subtract the different values added in getting it to that point. These will include transportation, processing, treatment etc. The net value is the value of the resource in its natural state. Suppose, for example, that the net value so calculated is rubles 1mn per unit (e.g. cubic meter), and suppose that the amount paid for the extraction of the resource is 0.4 mln rubles. Then the resource is undervalued in the oblast by 0.6 mln. rubles, and that value should be added to the accounts. The calculation of the true value of rubles X will also provide advice to the authorities on what it can charge for the exploitation of the resource, as a percentage of 0.6 mln can be collected without altering the economic incentives for exploitation too seriously. In the sections on the individual resources we give some examples of how the net value might be calculated.

4.2.2 Estimation of the Non-Market Use of Natural Resources

Several resources are not used through the market place and the net value from these resources should be estimated and added to the natural resource accounts. The main ones are: direct extraction of water, direct extraction of fuel wood, and non-commercial gathering of non-timber forest products. Valuation methods here will vary, but they rely on looking at two things – the marginal product of the resource and the market value of the alternative. So, for example, if fuelwood is used for cooking then the value can be made in terms of the cost of the next best alternative that would have to be used if fuelwood were not available. On the other side, if water is used in agriculture then its value is assessed in terms of its marginal contribution to the production of crops. Again examples are provided for specific cases below.

4.2.3 Estimation of Damages to the Natural Resource Base

There are some areas where existing resources of water and forests are being damaged by other activities such as agricultural run-off, disposal of effluents, etc. In some cases the authorities can and do take measures to correct the damage, such as treatment of water prior to use. The costs of such treatment should appear as a "defensive expenditure" in the environmental accounts. There is controversy as to whether such expenditure should be deducted from the national accounts. That need not concern us. We are interested in knowing what such expenditures are, so that we can make the polluters pay, or formulate environmental policy appropriately.

The other route to measuring the damages is to evaluate the environmental impacts and then value them. So, for example, if a particular source of water or parcel of land is rendered useable for a number of years by some economic activity then the loss of the use of that water or land is a damage. This can be measured by estimating the services that could be provided by that resource. If water, we would use the netback method to estimate the value of water flows; if land we would use the rental value of uncontaminated land.

4.2.4 Estimation of the Depletion Value of Natural Resources

Resources that are being run down imply that they will not be around for future use. In these circumstances some allowance should be made for the depletion. We discuss these methods in Section 4, where mineral assets are valued.

4.3 Valuation of Water Resources

Table 4.1 below describes the main sectors using water and the main sources. For each sector a method for valuing the resource is proposed.

Table 4.1 Different Water Uses

Sector/Source	Piped water	Open Ponds	Shallow wells	Tube wells	Springs	Rivers
Urban Household	X	X				
Small town Household	X	X	X			
Rural Household	X	X	X	X	X	X
Agriculture	X	X	X	X	X	X
Industry	X					X

4.3.1 Urban Households

The first step is to estimate the willingness to pay for the particular type of water. From that subtract the costs of getting the water to a stage at which the willingness to pay has been estimated. The difference gives the net value of the resource. Some of this may be paid by the users as a user fee. Subtract this user fee and the difference is the undervaluation of water. As an example let us consider the delivery of piped water to households in a urban area. Estimates from other countries indicate that the value among middle income households for piped water in the Philippines (North and Griffin, 1993) was around $52 per household per year in 1996 prices (plus the costs of supply). Assuming consumption per household of four people of around 180 m^3 per year, and a cost of supply of 50 cents a cubic meter, this amounts to 78 cents a m^3. The *per capita* income in the Philippines is around half that in Russia adjusting for purchasing power parity. Estimates of the income elasticity of demand for water are around 0.5. So a rough order of magnitude figure for Russia would be around $1.17 per cubic meter, or 6,500 rubles. If the household already pays, say 1,500 rubles a cubic meter then the undervaluation has been 6,500 rubles[4].

An alternative set of WTP values can be taken from US data. Gibbons (1986) estimates values for residential use differently in summer and winter. She estimates the WTP as the area under the demand curve for water, where the demand curve is based on a price elasticity of between -0.3 and -0.7 for one town (Tucson, Arizona) and -0.3 to -1.3 for another town (Raleigh N.C.). The implied marginal value of water can then be estimated from the demand curve. However, there are some problems in interpreting the data from Gibbons and we would not advise using that source.

The other major sources of water for urban households are cited as rainwater and ponds. We would not advise trying to value rain water. We have never seen that done in this context and it is should be taken as something that is exogenous to the resources that the state can control.

Households drawing water from ponds will have a value that can best be estimated from a questionnaire study to elicit the value of that water in terms of willingness to pay. In the absence of such studies, the value has to be estimated in an indirect manner. The figure below shows the steps to be taken to obtain a value in terms of willingness to pay. The first step is to look for WTP studies. If these are not available, the next step is to look for any market evidence for the water. In some cases water from open ponds or rivers may be sold to users. In other cases the user may have to buy water from carriers. Such water can be seen as a substitute for the pond water. If either of these sources of information are available, the value of water from them should be used as a guide to the willingness to pay for pond water. If no such data are available an approximation can be made by taking the willingness to pay for piped water and subtracting the costs of collection and treatment. If the full costs of collection are accounted for, including the value of time (taken as around 33 percent of the wage of the person concerned) and inconvenience then the estimate should not be too bad as a guide to the value of the open source water. The same analysis applies for river water or water from wells.

Figure 4.1 Decision Tree for Valuing Water Resources

[3] In estimating the costs of supply account must be taken for providing the raw water to the water company. This cost should be recovered from the company and is sometimes called a depletion tax. We discussed the estimation of this component briefly in Section 3.

[4] No deduction should be made for taxes paid by the different users, as they represent transfers and are not a real cost to the economy.

technology being used was similar.
prices in Yaroslavl, should offer the best guide to the value of water in irrigation.

4.3.2 Town Households

4.3.3 Rural Households

4.3.4 Agriculture

Table 4.2 Values of Irrigation Water in the US

Crop	State in US	Values: 1995 Cents per Cubic Meter
Wheat	California	3.4
Wheat	Washington	8.0
Sugar Beet	Washington	22.2
Potatoes	Idaho	100.7
Barley	Arizona	4.1-5.3
Vegetables	Arizona	18.0
Hops	Washington	1.5
Pasture	Colorado	5.4
Cabbage	Colorado	9.7
Tomatoes	California	60.0

4.3.5 Industry

4.4 Valuation of Forest Resources

Table 4.3: Use of Forest Resources

Sector/Use	Timber	Fuelwood	Non-timber products	Hunting
Household	X	X	X	X
Legal Commercial	X		X	
Illegal Commercial	X		X	

4.4.1 Commercial Use of Timber

4.4.2 Household Use of Timber

4.4.3 Fuelwood

We assume that the only use of fuelwood is by the households. We value this in terms of the opportunity cost. We estimate first the amount that is used in this way and the energy content of the fuel. This is converted into delivered energy for cooking or heating and valued in terms of what people pay for the same amount of commercial energy (via oil or gas). The energy values of the fuelwood and the amount you need to achieve a given amount of delivered energy compared to gas, for example, are numbers you should have. The value to be entered in the accounts is this estimated use value, less the costs of collection. Again, this is mainly a time cost, with time valued at 30-50 percent of the average wage of the group concerned.

4.4.3.1 Non-timber products and hunting

Non-timber products and hunting by households include mushrooms, plants, small animals etc. collected from the forest areas. We value these by taking their market value and deducting the costs of collection, as for timber. The problems will be in obtaining data on how much is collected, and how much time has been spent collecting it. Some local surveys will be needed for this purpose.

The illegal collection of non-timber products and hunting by households is not something we discussed much, but it may arise in relation to removing endangered species of plants and animals, as well as regular species of the kind that are also removed legally. For the regular species the valuation is the same as when they are legally collected. For the endangered species a special valuation of the damage done by removing them will have to be made. This is extremely difficult, and in the first analysis we would not advocate it. Instead we would focus on stating any such losses in physical terms.

The commercial collection of non-timber products includes special mushrooms, snakes and other biota. Estimates of the value of these proceeds in the same way as for commercial timber. Estimate the end use value or the value at the point of export from Yaroslavl and deduct the local costs of collection and treatment. That is the full natural value of the resource. From that, deduct any license fee or tax that the party exploiting the resource pays and the balance is the value that has to be added to the regional accounts.

4.5 The Valuation of Mineral Resources

4.5.1 General Issues

Mineral resources have a value in the ground similar to that of renewable resources such as forests and water. Where the state owns the resource it should collect a rent equal to the market value of the resource, less the full costs of extraction and processing (including an element for 'normal profit'). With public ownership the question of taxation is of less importance as the income goes to the state anyway. Of course there is the issue of how it should be divided between different levels of government, but that is a secondary question. Where the resource is privately owned, or owned by a parastatal company, the key question is whether this 'rent' should be taxed differently from other profits of enterprises.

One reason for taxing the rent at a higher rate is that the enterprise has some monopoly power which merits a higher tax on its profits. This would apply, for example, to a producer who had access to a low cost supply source, or to a producer who had a local monopoly of extraction (e.g. for sand or gravel) which is costly to import. In either case a higher rate of tax is warranted, and in order to estimate the tax it is necessary to estimate the rent.

The estimation of the rent proceeds in exactly the same way as the estimation of the net value for forests and water discussed above. Where the costs of extraction and distribution are higher than would be the case with competitive markets, an adjustment should be made for the overpricing of such items. The resulting rents will indicate how much the state can tax the resource over and above the normal taxation for all enterprises.

A second reason for imposing a higher tax is that the resource is being depleted, and a part of the rent should be allocated as a 'depletion premium'. This would tell us what the society should save, to allow an alternative stock of capital to be built up for future use, so that when the mineral source was exhausted, the country could continue to derive income at an equal level to the one currently enjoyed. Whether that depletion premium should be captured through a tax and then saved by the public sector, or whether the same savings could be made by the private sector, is an unresolved point. In either case, however, it is important to know what the depletion premium is so that appropriate measures can be instituted for its allocation to the saving stream.

There are three methods of valuing the depletion of natural resources:

The user cost method
The net-price method
The present value method.

These methods are described below. In each case we are interested in valuing the depletion of the resource. These methods are applicable for all exhaustible resources, or resources that you are going to run out of in a short to medium period of time. It is worth noting, however, that for any resource that has a life of more than 30 years it is probably not worth valuing as the depletion value will be very small.

In order to understand the different methods the following symbols and formulae will be needed:

4.5.1.1 ***Definitions***

O:	Operating costs of the sector
G:	Revenue earned by the asset
r:	Rate of return expected from the exploitation of the asset
K:	Total net fixed capital
UR:	Rent per unit of the asset
D:	Volume of annual production
T:	Life expectancy of the resource at present rates of extraction
VR:	Volume of proven reserves
V_T:	Present value of reserves at end of year T.
s:	Social rate of discount
N:	Net new discoveries

Formulae

R	=	$G - (O - r.K)$
UR	=	R/D
T	=	VR/D
V_T	=	$[1 - 1/(1+s)^T]/s.R$

4.5.2 The User Cost Method

4.5.3 The Net Price Method

4.5.4 The 'Present Value'

4.5.5 A Comparison of the Three Methods

4.6 Conclusions

This section has discussed the methodology to be used in valuing different resources in Yaroslavl. We have covered water, forest resources (including non-timber products, plants and animals), and mineral resources. For the items included we have given the basic method in each case (according to the user or the type of use). Based on this the valuation task can be initiated. The next section reports the results of applying these techniques to the valuation of resources in one 'okrug' of Yaroslavl – Danilov.

5. RESULTS OF A PRACTICAL MONETARY VALUATION OF NATURAL RESOURCES IN ONE PART OF YAROSLAVL OBLAST

5.1 Introduction

In this section the results of applying the valuation methods of Section 4 to natural resources in a part of the Yaroslavl are discussed. The specific area selected is that of Danilovsk municipal okrug. This part of the oblast of Yaroslavl was selected because of:

consistency with the needs for the Danilovsk municipal okrug, identified in the course of the special meetings with administrators in that region
the available regional data and validity

The results of the valuation exercise are reported for the following resources: water, forests and recreation. No attempt was made to value mineral resources. An application of the methods discussed in the previous section would not have shown any significant numbers for the main resources of the region – peat, sand, gravel, etc.

5.2. Water Resources

5.2.1 Brief Description of Water Resources and Water Issues

Within the Danilovsky Municipal Okrug (DMO) we can distinguish three basic types of water supply systems (WSS):

Household water mains
Outside hydrants
Wells, springs, and others.

To characterize the DMO water supply system it is essential to identify the basic types of settlements, which follow:

city (and suburbs)
a small town -i.e. concentrated rural settlement, involved in agriculture and closely located villages -- rural settlements with remotely located households, without a center.

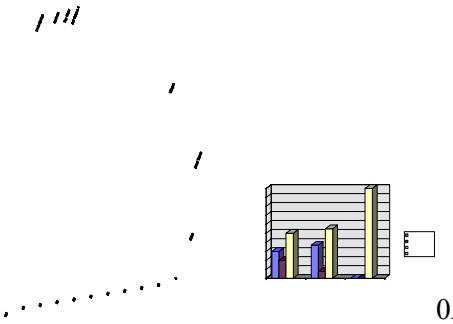
Such a division is essential since the density of population and the type of settlement influence the choice of household machinery used, the cost of WSS, and sewage and health risks. Table 5.1 presents this division and the related WSS and sewage costs and risks.

Due to short water supply distance and concentration of population, the cost for city water consumption is relatively low, both as a whole and *per capita*. At the same time the effluent disposal cost is relatively high, with health risk increasing along with increased water consumption. The cost of water supply per capita is high for the remote settlements, but the health risks are reduced. Figure 5.1 shows the different water supply systems in DMO.

Table 5.1 Different Settlements and Water Issues

Type of settlement	**Water supply cost**	**Health risk due to water quality**	**Disposal**	**Health risk due to effluent**
Cities and suburbs	low	high	high	high
Small towns	mean	mean	mean	mean
Villages	high	low	low	low

Figure 5.1 The Different Water Supply Systems in DMO by Type of Settlement



0A detailed study of water supply for Danilov was carried out in 1996 by "Dialogue - 2" Co. Until 1971 groundwater abstraction for Danilov was undertaken without planning, and reserves were not explored. In the early 1970s, due to increasing needs for the city, survey works were carried out and groundwater reserves were explored.

The current daily fresh water consumption, in accordance with Administration Head Resolution No. 78 of 11.04.96, is 5.5 - 5.7 thousand m^3. Within the city area, the abstraction source "GURUSHKA" is heavily used and its reserves are nearly exhausted. The increase of its capacity up to 4.0 thousand m^3 may

result in the drying up of that water table. In 1986 another three wells were drilled on Kinderevskoe area (0.78 thousand m^3) and put into operation. The water from this source shows a very high content of iron, partly for natural reasons and partly because there is a high level of wear on the main water pipe (transportation of water over a distance of 12 km). The wear of pipelines is aggravated by wandering currents, caused by the railway crossings. If, however, "Kinderevo" abstraction were to be shut down due to the poor quality of water, the town water deficiency would become 1.5 - 1.7 thousand m^3 a day.

On the territory of city, mainly in the northern and southeastern areas, another 22 departmental abstractions, not deep, consisting of 1-2 wells are available. Some of them do not work and require tamping, some have been already tamped.

The geologic survey in the northern part of city has revealed some new wells for drilling. Before developing these, the water authority has recommended that measures be taken to construct a water collecting ring for the major departmental abstractions. With the current lack of funding, however, this is not possible and the priority measures should be to rationalize the use of water from "GORUSHKA" and the departmental wells.

5.2.2 Payment for Water Use and Cost of Water

The payments for water supply are according to tariffs, introduced by the local Head Administration Resolution for the Danilov municipal okrug of 29.12.95 No 756, "On Regulatory Standards for Communal Services". Details of these payments are given in Table 5.2.

In 1996 the price of one cubic meter of water mains supply system provided by the Danilovsk municipal communal services was 4830 rubles/m^3. The cost of connection depends on particular conditions: distance to existing water supply network, its state of repair, etc.

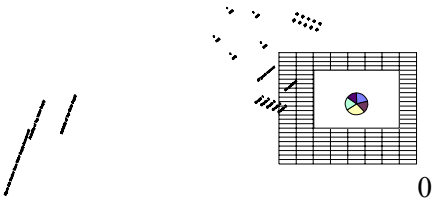
To estimate the quality of water supply for the Danilov city population, the selective survey was provided. The basic results are submitted on Figures 5.2 and 5.3. They reveal that:

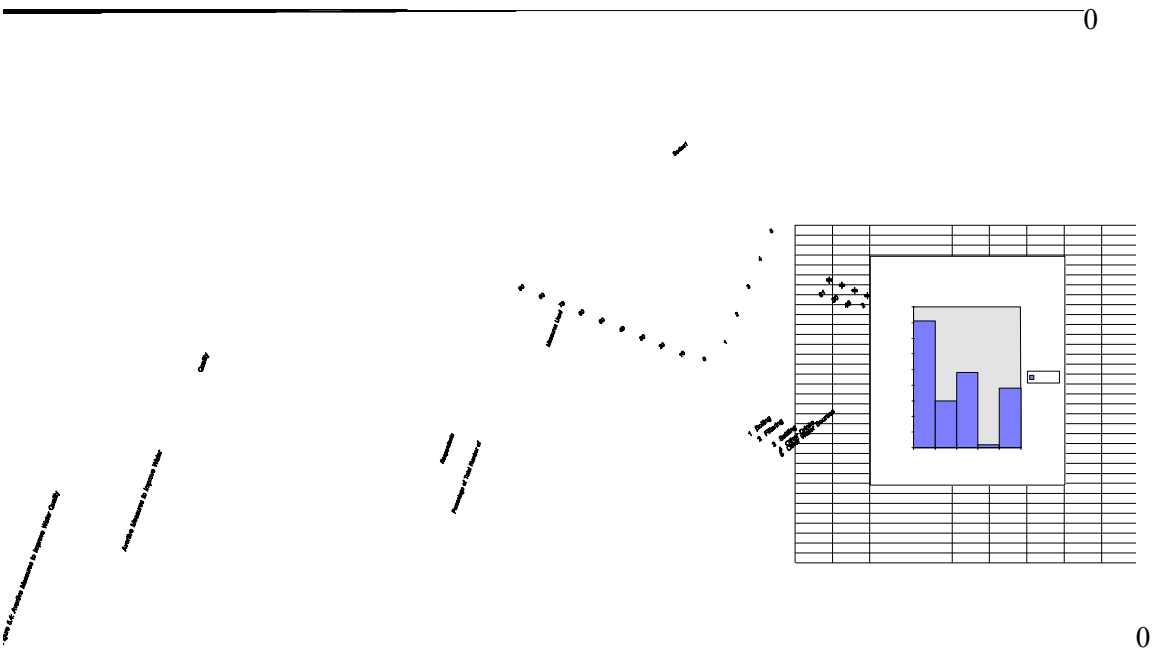
reliability of water supply is a matter of great concern or high concern (Grade 1 or 2) for nearly half the population

tap water quality is a matter of equal concern for over 40 percent of the population.

quality indicators of tap water are very bad or bad for 14 percent of the population in the best city district and for 52 percent of the population in the worst city district.

The survey also found that consumers often have to use sources other than tap water (mainly wells), even when the latter is nominally available. This is because of a failure of water supply (or a period when it is inadequate). In addition, many people take aversive measures to avoid perceived risks from their tap water: filtering, settling tap water, boiling, etc. Figure 5.4 gives details of these measures; over 80 percent boil the water, 30 percent filter it, 48 percent use some method of residue settlement, 40 percent purchase other drinking sources of water of other drinks. Unfortunately, the survey does not indicate how many households undertake more than one of these measures.





Thus, it is possible to state that the level of municipal water supply service is very low. The main reason for this is the chronic underfunding of the supply system. Monthly payment for household water consumption does not begin to cover water supply expenses. The revenues received (including the state grants) are so small, that they hardly cover the maintenance expenses. The result is a very low level of reliability. Furthermore, it adds a load on existing wells in the city, including those in private possession (there are cases when well owners demand money for using water) .

5.2.3 Water Supply in Small Towns (settlements of urban type) and Villages

A study of the condition of water supply in agricultural settlements was carried out by the "Cadastre" Co. during the period July - August 1996, and February 1997 in Semplovsk administrative territory for the settlement of Semplovo (20 km away from Danilov city) and for the villages of Toshnovo, Skipino, Lomki, Beklushki, Romantzevo, Byakishevo, Pochinok-Farm. This included a direct survey of the inhabitants as well as an expert opinion survey of the Danilovsk municipal okrug management. The survey covered trends in water quality and quality and household monetary evaluation of different kinds of water supply. The results are discussed below.

The basic sources for household water supply in the surveyed zone are groundwater tables, surface waters, surface flows (river Kast, Udisna) and ponds. The water main system provides the multi-storied houses in Semplovo settlement, some of which also use wells, springs, rivers, streams and ponds. The aggregate population, consuming water all year round, is 417 persons. The greatest number of inhabitants (89 percent) live at the Semplovo settlement and in the nearby Toshnovo village. In the summer, another

80 persons are added to the population. In addition about 170 persons come for holidays and weekends.

Figure 5.5 Characteristics of Village Settlements

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Figure 5.5 gives the breakdown of the population between permanent and temporary for the different localities. As can be seen, there is an uneven increase of inhabitants during summer. (Semplovo has 1.2 times its normal population, Beklushki has 7.9 times, Byakishevo 28 times). Thus, the water sources experience a varied, increased strain in the summer.

This is characteristic of the whole Oblast, where the demographic situation has changed drastically as a result of a campaign to 'liquidate' the unpromising villages in 1970s. This program resulted in many abandoned dwellings, and the authorities made a free provision of the same to those who wanted to take them. All this has impacted on the nature of household water consumption. It can be said that the decision-making bodies did not fully realize the impact of the policies when they allowed the expansion.

The basic results concerning availability, condition, characteristics of water supply and also tendencies, observable in the last decades, are as follows:

Drilled Wells.
These sources of household water supply have begun to be used in the last decades. Artesian wells are available for public use: four of them are in the settlement of Semplovo (and are intended to supply tap water to the settlement and the close-by Toshanovo village) and one is in the village of Lomki (for cattle farm water supply). Water from artesian wells is rather hard with a high content of iron oxides. At the moment, due to a sharp shortage of finance for repair and maintenance, the village of Semplovo has only one well fit for operation. This is the reason why the water flow is insufficient, with frequent water supply failures. In Toshanovo village the household tap water did not operate at all.

The other drilled wells have a depth of to 15 meters and are drilled mainly by the individual users for their own needs. Typically, they are former city dwellers who bought the village houses and can afford technical improvements. The quality of water in these drilling wells is similar to that of well water.

Shallow Wells
These are the traditional and the most frequently used source of water both in villages and settlements. In spite of the fact that for the last twenty years their number within the surveyed area is left unchanged, their location and quality has greatly altered.

As a result of the former policy aimed at liquidation of unpromising villages and consolidation of the rural population within the centers of Sovkhoz and Kollhoz (state collective farms), the total number of

wells in the of settlement Semplovo has increased (despite the water mains system availability within the settlement). The current number of wells in Lomki and Beklushki has also surpassed the number of wells in 1976.

The qualitative structure of wells has greatly changed. Unlike the current wells, which are drilled to no more than 3-4 meters and which collect only surface waters, the former wells were at a depth of more than 10 meters. As a consequence, there exists a water shortage (especially during summer) which is solved by the organized trucking of water. The wells in this case are used as tanks keeping water.

The most distinct trend within the surveyed area regarding the use of wells is the significant shift towards private use (by one family or a joint use by two families). The resources are treated as private with owners imposing a charge on other users. Where wells are shared by a number of users, a system of fees has been established; at present it is around 2 thousand rubles *per annum* for a permanent resident and 4 thousand rubles for a summertime resident. These 'private' arrangements are bypassing the system where the local administration provided and maintained the wells; in fact the public wells are now in a state of poor repair.

Springs
These are used by most inhabitants as sources of drinking water supply. The exception is a spring 400 meters away from Lomki village, which was used in 70's and at the moment is deserted. As with wells, there is a trend for springs to move toward private use. For example, in Beklushki two years ago the local spring was adopted by nearby households as their responsibility; at present they maintain the spring and offer limited access to the other inhabitants, especially the summertime residents.

Rivers and Streams.
The surveyed area holds the rivers Kast and Udisna which have rather clean water compared to the other rivers of Yaroslavl Oblast. But the majority of inhabitants consider the rivers dirty compared to groundwaters and mainly use river water for non-drinking household needs. However, the inhabitants of Byakishevo, where not a single well is in operation, use river water for drinking (although they say boiling is obligatory), as the spring with water of high quality is rather far away.

Ponds
These are available in all settlements and are used mainly for washing, watering, fire-prevention, and sometimes for livestock. The number of ponds has increased slightly over the last decade. To a great extent, this is attributable to the availability of powerful digging equipment. Where new ponds are dug, all expenses incurred in pond construction are met by the inhabitants. In addition, there are attempts to turn the public-used ponds into private ones. For example, one of the inhabitants from Beklushki village made a fence around a public pond (blocking an access way to village), so that only his neighbors have access to this pond.

Attachment facilities to collect rain waters
Many houses have attachment facilities to collect rain water for household needs (vegetable garden watering, footwear washing, etc.). Opinion on the water quality, expressed by the inhabitants varies, from "very soft" to " very dirty".

Conclusion on water supply in DMO
In conclusion, we may state that, with increases numbers of residents, the demand for water in DMO is increasing. Much of this demand is being met through private supplies; private wells, springs, private abstraction from surface waters and privately dug ponds. At the same time, the public sources are

increasingly under-funded and the quality of supply is deteriorating. The impact of this is greatest on those who do not have access to private supplies, particularly those living in multi-storied accommodations. For them the health risks are increasing. This is especially serious with respect to the sewage facilities, which are leaking effluent due to low level maintenance and the lack of the sewage disposal cleaning facilities.

This conclusion of the water situation in DMO is confirmed by the target working group on water problems for the municipality. The basic reason lies in the difficult economic conditions that the Danilovsk Municipal Okrug Communal Service, along with the enterprises which undertake the abstractions, are experiencing today. The water consumption fees are so small that they hardly maintain the very low level of reliable functioning. Thus, it can be said that the water supply appears to be in a "low level balancing trap", i.e. bad water supply brings negligible profits, adding to the further low services.

The small towns such as Semplovo appear to be in an even worse position. The Communal Service does not have funds for maintenance and repair of the water supply network (Semplovo running water system), and as a result there are frequent failures. The crisis has also affected the village conventional water sources. Most of them have fallen into disrepair and are no longer in operation. The amount of the fees is negligible and cannot improve the situation.

In these circumstances it is essential to allocate efforts and resources in water supply improvement where they matter most. In order to determine this, we need to know the value users place on the different services, and that in turn requires a valuation of the water according to the principles laid out in the previous section. The next section reports the results of such a valuation.

5.2.4 Monetary Valuation of Water

According to a number of authorities the monetary valuation of natural resources is the most difficult task in the preparation of environmental and economical accounting and statistics. (Beckenbach, Hampicke and Schulz, 1989; Pearce, Markandya and Barbier, 1989, ch.9) The UNSO published "Guide on Integrated and Environmental Accounting" (Integrated Environmental and Economic Accounting, 1993) identifies three possible ways for natural sources evaluation, including:

direct monetary valuation
direct non-market valuation (including the notion like "willingness to pay");
indirect non-market valuation (including expenditure data: for instance, related to damage expenses or the costs of meeting prescribed standards provision).

In this section we report the results both of direct valuation and direct non-market valuation. The valuations were carried out in three distinct areas: Danilov town, urban settlements in DMO, and villages in DMO. The results of each of these are discussed below.

5.2.4.1 Monetary valuation in Danilov town

This section reports the results of the three methods of valuation discussed above.

Direct monetary valuation of water consumed in Danilov town

The direct monetary valuation for water is the actual payment made for the water. This is compared with the cost, and any difference is treated as a surplus value for the water. At present it is possible to provide the direct monetary valuation on the basis of the current tariff for non-recycled water consumption in compliance with the Law for Yaroslavskay Oblast, "On Yaroslavl Regional State Budget for 1997"

adopted on 21.01.97 and following the total water consumption for the municipal okrug. This is done by taking the amount of water used under different categories and the average payment made per cubic meter for those categories. On that basis the direct monetary valuation of water consumed in Danilovsk municipal okrug was 12,840.7 thousand rubles in 1996. This is made up of 35.2 thousand m^3 of surface water abstraction at 14.69 rubles per cubic meter and 508.4 thousand m^3 of underground water abstraction at 24.24 rubles per cubic meter.

This direct monetary valuation may be determined by comparing the amount of payments made by the residents for water consumption (tap water, hydrant, well) together with existing expenses. Depending on the type of water supply, the valuation is determined by three options:

household tap water
hydrant use
well use

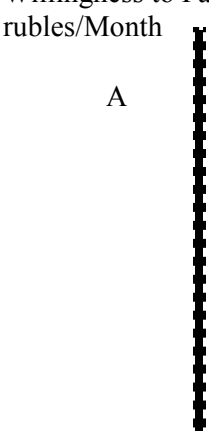
Household tap water. The current monthly tariff for household water supply with all conveniences is 1,300 rubles per person and the consumption standard per person is 6.3 cubic meters per month, the payment for water amounts to 206.3 rubles per cubic meter. This is an average value of the water consumed. Supply costs, like preparation of water and delivery, are 4,830 rubles per cubic meter (water at cost for the communal municipal service). In this way, the direct monetary valuation of water coming into the house is 206- 4830 = -4624 rubles per cubic meter.

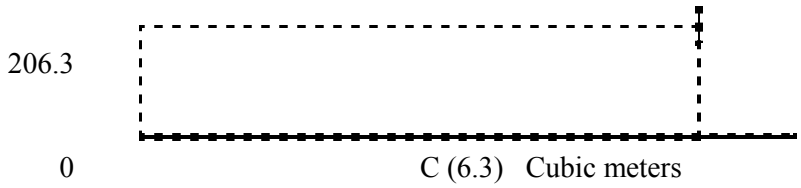
Although this method of valuation looks revealing, it is not useful in terms of what value households really place on water and what they are willing to pay for it. Households will be willing to pay more for the water they consume than the 1,300 ruble monthly rate. The first unit or cubic meter consumed would be worth much more as it is essential to life. Each subsequent unit is worth less than the unit before and the last unit is worth zero because the household does not have to pay anything for it. Figure 5.6 shows this clearly. The total value of the water is the area OAC but the payment is the area shaded, which will generally be less than the total value. The information gained from such a calculation is the extent of the deficit per cubic meter supplied. This is not, however, a guide to how water supply should be reformed.

Outside hydrant. On the same basis as above, we can calculate the budgetary deficit per cubic meter for outside hydrants. The current monthly tariff for hydrant use is 210 rubles per person, making a payment of 209 rubles per cubic meter. The costs of supply including preparation and delivery expenses is 4830 rubles per cubic meter, making a loss of 209-4830=-4621 rubles per cubic meter.

Wells use. The direct monetary evaluation for the urban households cannot be determined, since there is no way to identify the maintenance and construction expenses: there is no fixed well fee, the expenses of the residents on the maintenance and repair of the wells (both public and private) cannot be considered as reliable due to insufficient sampling.

Figure 5.6 Valuation of Water and Payments for Water





The above analysis reveals a large deficit to the supplier. The actual water fee should have been based on the account of real services at a cost of 4,830 rubles/m^3 with a profit margin of 25 percent. This would amount to an average charge of 6,038 rubles/ m^3. The current tariff is tiny in comparison and does not provide for the normal operation of the communal services. Besides, the tariff differentiation is insignificant (the estimated fee for one cubic meter is 206 rubles for tap water and 209 rubles for hydrant use).

The development of communal service is hampered by the drastic deterioration in living standards, which results in the low-level of charges for water supply services. This is not, however, the same as the willingness to pay for water. The latter may also be low, but should be more than the actual payments, at least for good quality water.

Direct non-market valuation (Contingent Valuation) for Danilov Town
The direct non-market valuation was done by using the subjective contingent valuation method discussed in the previous section. It elicits what people are willing to pay (WTP) for the services of tap water by using suitably framed questionnaires. The method of direct questioning was used in a primary survey of WTP. The respondents were chosen from a random sample of residents without tap water (they use hydrants, wells, etc.). The conditions and the willingness to pay to have tap water at home were estimated. Also estimated were the costs of possible connection to the water system and the water fee (willingness to pay). The sample of respondents was taken from Danilov town and numbered.

The survey results showed that the inhabitants spend 40 min/day on average to provide for household water needs. Of the surveyed inhabitants 35 percent used hydrants, while 65 percent used wells. The survey revealed that 45 percent of the respondents said they were satisfied by these water sources and that 46 percent of respondents did not want to be connected to a mains supply. The main reasons given were: no money to pay for connection, no sewage system in the house, and low quality of tap water.

If the respondents expressed a positive WTP for a connection, they were asked what their willingness to pay was. The method of elicitation was an open-ended questionnaire which was preceded by a presentation of the issue being investigated and a description of the quality and type of service that would be provided. There was a distribution of values obtained on a responses rate of 34 percent, with a mean value of 145,000 rubles, which is only a small percentage of the actual cost of making a connection. Figure 5.7 shows the distribution of WTP for a connection. Only 8 percent of those surveyed gave a figure of 500,000 rubles and higher, and only 4 percent gave a figure of one million rubles and higher.

The survey went on to ask the monthly WTP of respondents for water of good quality, assuming they had a connection. This time the response rate was 51 percent and the mean WTP was 500 rubles a month. The question did not ask for a WTP per cubic meter, or give a limit on how much water the household could consume. If the questions were well understood and the respondents truthful, we would obtain the

area OAC in Figure 5.6 as the answer. This is still less than the marginal cost of supply, however it is 1.6 times higher than the existing price in the municipal okrug tariff, for water supply to houses not connected to the sewage system (currently 320 rubles per month per person). Thus the survey would suggest that there is some scope for increasing tariffs even in these difficult times. Figure 5.8 gives the distribution of WTP across the sample. It is worth noting that some countries exploit this difference in WTP for water by having charges that differ according to household type. Richer households are made to pay more by making the tariff depend on house area. Alternatively we can introduce metering and have a lower price for the first few units followed by higher prices for subsequent units.

Based on the WTP obtained above of 500 rubles per month per person and the average water consumption for houses not having sewage of 1.52 m^3 per month, the willingness to pay is estimated at 330 rubles per m^3. The water preparation and transport expenses (communal service water at cost) are 4830 rubles per m^3. Thus the direct non-market value of water is: 330 - 4830 = -4500 rubles per m^3 (negative value). The main lesson to draw from this analysis is that, on a WTP basis, the supply of tap water is not justified to the 'average' household. Those with a higher WTP would justify the service. From Figure 5.8 this is less than 5 percent of the population in this area. It is possible, however, that society would value the provision of tap water at more than the WTP of low income households. This may be because of the indirect benefits of tap water (reduced illness, disease etc.) which are benefits to society, and because the present low income levels are a temporary phenomenon, resulting from the economic crises in the country. One way in which the bias from the latter can be reduced is to measure the WTP in terms of both money income and time. Some people may be willing to pay for water services by devoting time to providing the connections or undertaking other public sector work. This was not investigated for the water in this study but was looked at for the recreation sector. As a follow-up to this work it may be possible to see how much the WTP goes up if we allow for such payments 'in kind'.

Although the valuation exercise is limited, it does indicate that there is a higher WTP than the actual tariff. The latter is 210 rubles per m^3, which is 120 rubles less than the WTP for tap water. It is also interesting to note that the 330 rubles per cubic meter is much more than the existing fee for the drilling well water supply, which is about 24.24 rubles per m^3.

Alternative method of assessing the direct non-market valuation of water consumed in Danilov Town
An alternative method of obtaining the WTP for water in DMO is to look at other studies on the same subject in other countries and regions and then 'transfer' the values to DMO. Using data discussed in Section 4 we obtain a tentative estimate of tap water as 6.5 thousand rubles per cubic meter. This is based on the following calculation.

Studies on market valuation of water carried out in different countries (such as that in the Philippines) show that the willingness to pay for tap water for families with an average income is $52 *per annum* per household in 1996 prices, plus the costs of delivery. If a family of four persons consumes 180 cubic meters *per annum* and the delivery cost is 50 cents per cubic meter (average figures for a country such as the Philippines), then the total WTP per cubic meter is 78 cents. The Philippines average *per capita* income is about half that of Russia, when allowance has been made for difference in the purchasing capacities of the currencies. The income elasticity value of water consumption is 0.5. In this way, the approximate value for Russia would make around $1.17 or 6,500 rubles per cubic meter. This is much higher than the 330 rubles figure obtained above and, if correct, would justify increased tap water provision as well as providing a positive net value to the water resource in the environmental accounts. We believe that the difference between the two numbers is the result of a serious undervaluation of long term WTP in the present study. The reasons for this are clear:

individual's money incomes are seriously below their long term levels. If we could include the WTP in kind we would correct at least part of this error. This is especially true if they could contribute to the work required for the connection;

there is, to a considerable extent, the stereotypes of wide accessibility and "free of charge water supply services" Individuals still see water in this light and their WTP answers are colored by that.

the quality of the present service is very low and the WTP reflects that. If the question could obtain the WTP for a better quality of service the numbers would be higher.

Indirect Non-Market Valuation for Danilov Town

The indirect water valuation is based on the costs that households incur to provide services such as safe water supply when the latter are not available from the municipal sources. The survey of water use carried out in Danilov town and the surrounding areas showed that many residents of Danilov with tap water in their houses also use aversive measures (filtering, boiling, etc.) The actual costs for the aversive measures can be used to provide an indirect non-market valuation of the particular feature being considered. The average amount spent on such measures was 17,500 rubles per month. It should be noted that these costs are the minimum values for those services; aversive measures have costs that cannot be measured and which would be avoided if the municipal water was of a high enough quality.

This information is complementary to that on the WTP for the present water quality service; it is a guide to how much the WTP would go up if the service was improved in the way being considered.

5.2.4.2 Water valuation in urban settlements

The water quality in urban settlements was carried out on the basis of a survey in the settlement of Semplovo.

Direct monetary water valuation

Household water supply. The direct monetary valuation (tap water at home) in the urban settlements can be done by taking the tariff for water use without hot water (1000 rubles per month per person at an average consumption of 5.0 m^3 per month per person, making a unit payment of 200 rubles/m^3). The supply costs are the same as for Danilov town, namely 4,830 rubles per m^3. Hence the resulting valuation is 200 -4.830 = - 4.630 rubles/ m^3

Outside hydrant use. The direct monetary valuation for hydrant use within urban settlements based on the current tariff, consumption levels and the existing water supply payments of 210 rubles per month for 1.003 m^3 amounts to 209-4.830 = - 4621 rubles/ m^3.

Well water use. A significant number of residents around urban settlements use wells (public or private). The maintenance and the repair is provided at the account of the owners. The public wells maintenance expenses along with the other expenses, like paths and transfers, are partially provided through self-imposed fees. Data to determine the maintenance costs of wells is not available. It would require another study to collect the relevant data.

It should be noted that these values are not the WTP for water, nor do they tell us that the relevant water service should not be provided. Rather, they tell us that there is a major deficit in the water financing system which needs to be addressed.

Direct non- market valuation for urban settlements (contingent valuation)

The direct non-market valuation for urban settlements was carried out in the same way as for Danilov town. The reference conditions given to the respondents was of tap water of high quality and without

failures in supply. The survey covered Semplovo and Tosjanovo villages (the water mains system is available there). The survey elicited the WTP for monthly service of water only, not for the connection.

Thirty percent of those surveyed did not wish to be connected to the settlement water mains system. The basic reason given was frequent failures, low quality and the desire to have an individual water source. Many residents who expressed the desire to have tap water said that they had no money to do this. Further questions on the possibility of introducing minimal expenses for the connection, would end in a refusal to have a connection to the water mains system at all.

The WTP for water per month per person, expressed in the course of the survey, under the condition of the failure-proof, quality supply amounted to 4-6 thousand rubles. The results obtained show that many village residents agreed to pay a higher fee despite their lower income compared to the town residents (The average for Danilov town was 500 rubles per person per month). This is influenced to a considerable extent by the increased need of water among the agricultural residents compared to the town residents (for watering, livestock, etc.). Based on a consumption by such households of around 5 cubic meters a month this WTP amounted to about 1000 rubles per cubic meter. The obtained data for Semplovo should be regarded as a preliminary study. In order to obtain more detailed information it is essential to conduct a similar study for other territories within the Danilovsk municipal okrug that will enable a real evaluation of the water management policy for the urban settlements.

5.2.4.3 Water valuation in the villages

The water valuation for the villages was carried out through surveys in the villages of Skipino, Beklushki, Lomki, Byakisheeevo, Toshanovo and the Pochinik farm. The standard water sources are wells and springs, with other sources less common.

Direct monetary evaluation of water in villages

The direct monetary valuation of water under the current conditions can only be approximately identified. The village water supply (mainly the well) is for public and for individual use. For individual wells the maintenance and repair is provided by the owner. For public wells, maintenance costs are partially provided from the self-imposed fees. Currently, the self-imposed fees are from 3 to 5 thousand rubles *per annum* per family (according to the different administrative territories). If we assume that 30 percent of this sum goes towards maintenance, then the direct monetary valuation of water is about 1.2 thousand rubles *per annum* (or 100 rubles per month) per family. In addition, there are time costs to be added. The study team has made an estimate based on valuing time at 30 percent of the average wage and comes up with a cost of approximately 1458 rubles/cubic meter. This must, however, be considered as a tentative estimate.

Direct non-market valuation in villages (contingent valuation)

The CV survey showed that WTP for clean water at home was positive for only 10 percent of the surveyed residents. These were former town residents. Practically all the local village residents and many summer residences said they would not pay anything for clean tap water. The refusals were expressed in many ways: doubt about the good quality of the water, the lack of money, frequent failures in the system, etc. Nearly everyone remarked that the water has always been accessible and free of charge. This position is likely to be connected to the communal tradition of land and water property spread among the villages. Therefore, it appeared to be impossible to identify the "willingness to pay" in this survey.

Those few respondents who agreed to consider the clean water fee made a distinction between drinking and household water. Some of the women respondents said that they are ready to pay only for very clean and tasty water for a small amount of 15 to 20 liters a day, indicating that 10 thousand rubles per month

per a family is the maximum possible fee for the drinking water, including delivery (i.e. 20 rubles per liter).

Another group of those interviewed said that they would prefer to get a large amount of water for their household needs 200-300 liters per day (of the same quality as drinking water) from the wells or springs like before. Some of these interviewees mention the healing properties of the water from the springs. These households were asked for their maximum WTP for this quantity of good quality well water. The response was an average value of 20 thousand rubles per month or 2-3 rubles per liter. The village survey shows that there is no "willingness for pay" for tap water among the village residents. The only values obtained were for 'clean water' collected from the well or 'very clean drinking water' delivered to the house. For 'very clean water' delivered to the house the WTP is about 20 rubles per liter for drinking and for the clean water from the well it is 2-3 rubles per liter. It is likely that the WTP has been underestimated for the same reasons as were given for Danilov town: lack of money income, lack of confidence in the ability of the authority to deliver the service being promised and general unwillingness to pay for something that has been seen as free.

Even allowing for the underestimation of the water, however, the data is such that there is no justification for a costly water mains system network for the villages. The data is useful, however, in valuing the water obtained from wells. If we subtract from this the costs of collection and maintenance we will obtain the net value of such water. Unfortunately this study could not collect all the data required for this, but a rough guide would be the following. Assume a household uses 250 liters a day and values it at 2.5 rubles. The total value *per annum* is 228,000 rubles. The maintenance cost is around 1458 rubles per cubic meter. Take away the maintenance cost and the cost of collection and we would have the net value of the well water of 1042 rubles per cubic meter.

5.2.4.4 Conclusion on valuation of water use by households.

The main results of this study in water valuation for household use in DMO are:

The payments for water are well below the costs of supply for all categories of users. Hence a negative value is obtained for the net 'value' of water if one subtracts the costs of supply from the payment per cubic meter. This is not, however, a good way of valuing the water, as it does not pick up the WTP.

The WTP for water was estimated for three areas: the main town, urban settlements and villages. In the main town of Danilov, 54 percent of households were willing to pay for a connection, but the average amount was low -- only 145,000 rubles, when the cost of a connection is much higher than that. The WTP for unlimited good quality water without interruption was also low -- only 330 rubles per cubic meter. The cost of supply (given a connection) is 4830 rubles, so there is a big gap here as well. We believe that this survey undervalues the WTP for water for a number of reasons. One is the shortage of money income relative to its long-term expected value. A second is the lack of confidence that the supply will in fact be what the surveyor states it will be. A third is the entrenched belief that water should be supplied at a very low cost (or no cost at all). For all these reasons the WTP figure is too low, although it is still higher than the actual payment, which is only 210 rubles per cubic meter. If ones takes the WTP from other countries and adjusts it for differences in real income, one gets a value of 6,500 rubles per cubic meter for delivered tap water. Further study is needed for these differences to be resolved.

A method of valuing water quality improvements is the cost that households spend themselves to make improvements. On that basis an improvement in supply that delivered water of drinking quality would have a value of 17,500 rubles per month.

For urban settlements the results are similar to those discussed above. Actual payments do not cover costs of supply, and moreover are not well differentiated according to the type of service. Hydrants,

for example, are paid for at almost the same rate as piped water supplies. The WTP studies revealed a higher WTP for tap water -- around 5,000 rubles per person per month or about 1000 rubles per cubic meter. This is probably because these households use a lot of water for cattle etc. and would find the service of greater value for that reason.

In the villages there is little desire for tap water, although there is a WTP for high quality drinking water of around 20 rubles/liter, and a WTP for clean well water of 2-3 rubles a liter (2000-3000 rubles per cubic mete). There is also a lower bound estimate of the WTP for well water based on expenditures undertaken by users in maintenance and time for collection. This is 1,458 rubles per month.

The implications of the study are that in areas where water supply is currently provided, charges may be raised a little to cover an increased part of the costs of the system but, more importantly, we should look at innovative ways of capturing a higher portion of the WTP. One suggestion is that household organizations contribute in kind to the maintenance of supply systems. Another is grant loans to residents to make the connections with their own labor. A third option is to vary the charges, so that those with a higher WTP in fact pay more (e.g. summer residents in villages). That said, there are always going to be users for whom the WTP for main water is less than the cost. For such households a social view needs to be taken of the wider benefits of the supply against the costs of providing the service. Finally the WTP for improving the water quality is relatively high. It remains an open question as to which programs could be designed to improve the quality at a smaller cost than this WTP.

In section 5.2.4.7 we use the estimated WTP for water to obtain a net value of water for the DMO and the region as a whole.

5.2.4.5 Valuation of water use in agriculture

In Section 4 we stated that water use in agriculture should be valued in terms of its contribution to output and gave some values from other countries. Unfortunately it was not possible to apply this method to the DMO. The only data available are the payments made for abstractions by the agricultural sector. There are 25 agricultural enterprises in the DMO, with 12,410 head of cattle and 8,700 bull calves at the present time. They obtain water from the same sources as households, so we have valued the water under the household use section or they pay for direct abstraction. We do not know how these charges for direct abstraction are related to the value of the water in cattle production and the growing of crops. Estimates of the value of income from abstractions is given in section 5.2.4.7 but, as stated above, this does not tell us what the value of the water is in terms of its contributions to production.

5.2.4.6 Valuation of water use in industry

As for agriculture, the value of water in industry is the contribution it makes to a particular production process. Examples of water values from such studies are given in Section 4, but similar studies could not be carried out in the framework of this project. Instead, industrial enterprises either receive water from the mains system (for which they pay a given tariff), or they obtain a license to abstract it from underground or surface sources, for which they pay a tax. Details of taxes paid are given in the next section.

5.2.4.7 Total value of water in DMO

We can now use the different valuations of water use to obtain an estimate of the value of water in the DMO. For all the reasons discussed above, this will be an imperfect estimate. A number of the uses have not been valued in WTP terms and those that have been so valued have had serious problems in the estimation. Nevertheless, it is a useful exercise to obtain this value and should be seen as a first step.

Table 5.3 gives the details of water use by households, agriculture and industry and the revenues

obtained, both gross and net of costs of supply.

Table 5.3 Direct Monetary Valuation of Water in DMO

Sector	Volume of Water Used Per Annum 000 cubic meters	Gross Payment Millions rubles	Net Value
Households 1/			
Urban dwellings	1519.7	311.8	-6929.3
Country dwellings	393.3	52.0	-1200.3
TOTAL	1913.0	363.8	-7544.9
Agriculture 2/			
Subsoil sources	580.0	196.1	196.1
Surface sources	64.0	00.0	00.0
TOTAL	644.0	196.1	196.1
Industry 3/			
Subsoil sources	720.7	364.1	364.1
Surface sources	19.6	0.3	0.3
TOTAL	740.3	364.4	364.4
TOTAL	3927.3	924.3	-6984.4

Notes:

Only water from subsoil sources is valued. Country dwellings obtain water from surface sources but that is not charged for.

Agricultural use of water from mains supply is charged as household use. The payments for abstraction are made up of 29 percent 'tax on right to use' and 71 percent 'mineral reproduction tax'.

Industrial subsoil use includes a small amount of mains supply water paid for through a tariff. The total payments are made up of: mains supply tariff (4.4 percent), 'tax on right to use (47.8 percent) and 'mineral reproduction tax' (47.8 percent). Payment for superficial water is charged under a tariff.

The net value is -6.9 billion rubles (approximately $1.2 million). This could be reduced by taking a number of measures that are discussed above. Table 5.4 gives the valuations based on the WTP studies for the household sector alone. These figures indicate that a higher value can be attached to water, both the mains supply and the wells. There is, in particular, a large benefit to country dwellings, which is not captured in the charges.

Table 5.4 WTP Monetary Valuation of Water in DMO

Sector	Volume of Water Used Per Annum 000 cubic meters	WTP in Local CV Study (mln. rubles)	WTP from Other Studies (mln. rubles)	Net Value (mln. rubles)
Urban homes 1/	1519.7	494.2	9878.1	-6929.3 to +2460.9
Country dwellings 2/	380.3	950.8	554.3	554.3 to 950.8
TOTAL	1900.0	1445.0	10432.4	-6375.0 to 3411.7

Notes:

Urban homes include townships and urban dwellings. The WTP value taken is 330 rubles per cubic meter. The 'other studies value is taken from the Philippines study as 6,500 rubles per cubic meter.

Country dwellings are dwellings not receiving mains water. The WTP is for well water. The WTP value is based on a figure 2.5 rubles per liter of good quality well water. The 'other studies' figure is 1458 rubles per cubic meter based on maintenance costs, including time costs.

This analysis of water resources is a preliminary attempt at valuing water in the DMO. In spite of its many limitations it has proved useful in showing where certain practices are inefficient and in pointing to the kinds of reforms in water pricing and taxation that could improve the situation.

5.3 Forest Resources

5.3.1 Introduction

About 53.4 percent of the Danilovsk municipal territory is covered by the forests. The forestry within the Danilovsk okrug is provided by "Danilovskiy" leshoz (forestry) incorporated into "Yaroslavlselles" and the Danilovsk leshoz (uniting 6 forest companies).

The forests within the okrug are divided into exploited (group 2) and protected (group 1), with domination of the leafed trees. The forest areas are used for cattle feeding, hay collection, mushroom and berry gathering, as well as for hunting. Protection of animals is provided by the Hunting Management for the Yaroslavl Oblast. Table 5.5 shows the forestry resources of the different okrugs in the oblast.

The target working group analyzed the various forestry problems. The main issues to be considered are: poor maintenance of forest stocks; violation of cutting standards; inefficient timber processing and the inadequate prices of timber. In the opinion of the forest experts these problems are due to the insufficient investments, inadequate legal foundations for the sectors activities, and a lack of the timber processing equipment. Within the Danilovsk municipal okrug, like in the other Russian regions, there is currently a considerable reduction of the harvest of wood along with an increased exploitation of mature and coniferous trees, especially in accessible areas. The wood processing enterprises are not working efficiently. Considerable problems have been observed in forestry management, in the collection of taxes for natural resources and in the lack of investments. All these factors have had a negative impact on the forest sector. The multipurpose approach adopted by the forest committees was fine on paper but was not effective in practice, mainly because territorial co-ordination is not sufficiently developed and the local municipal administration does not have the legal rights to co-ordinate the activities.

Table 5.5 Forest Resources in Yaroslavl

Districts	**Forest Cover thousand ha**	**Timber Stock Mn.m^3**	**Mature Forests Mn.m^3**	**Coniferous Forests Mn.m^3**	**Deciduous Forests Mn.m^3**
Danilovski	105.3	14.9	2.8 (18.8 %)	0.5	2.3
Lubimsky	122.2	12.4	4.1 (33.1 %)	0.9	3.2
Pervomaiski	144.6	9.9	2.6 (26.3 %)	0.6	1.98
Poshechonski	294.2	17	4.9 (28.9 %)	0.8	4.1
Mean Value	155	13.5	3.6 (100 %)	0.7	2.9

The DMO introduced market tendering for rights to cut timber in Danilovsk municipal okrug in 1996, but the experiment failed. The lack of bids by the private sector was attributed to the lack of funds among local consumers and potential buyers, and to the uncompetitiveness of DMO timber given that wood is available at a minimal price from outside sources.

Had timber auction prices existed we could have used them as the point of departure for the valuation of timber resources. In their absence we have had to resort of direct and indirect market valuations, based on end prices and values in use of the products.

5.3.2 Monetary Valuation of the Forest Resources

There are three major uses that have to be analyzed:

legal wood commerce
illegal wood commerce
wood for the household

The present study on monetary evaluation for wood is based on current tariffs and prices.

5.3.2.1 Legal wood commerce

The commercial wood cost is estimated at the point of the end use in Danilov or at the point of departure from the Danilovsk municipal okrug. From that the following expenses are deducted: harvesting and processing. The license fees for the cutting rights along with the other taxes are not deducted. The result obtained is the net value of the wood cost. This can be compared with the stumpage fees that are charged to the felling companies.

The sale price of commercial sawnwood in DMO as of 1.10.96 was: 170,000 rubles per cubic meter for coniferous wood and 90,000 rubles per cubic meter for wood from broad-leaved trees. The proportion of that value that is not accounted for by harvesting and processing costs ranges from 6 percent to 24 percent for coniferous and 1 percent to 23 percent for broad-leaved. Hence we can take the timber values as ranging from 10,200 to 40,800 rubles for coniferous and 900 to 20,700 for broad-leaved.

The stumpage fees charged in the okrug are given in Table 5.6 below.

Table 5.6 Stumpage Fees for Different Kinds of Timber

Commercial Timber	**Large**	**Medium**	**Small**	**Firewood**Fee Rate I (10 km to point of transportation from forest)
Pine	41366	29623	14812	1160
Fir	37284	26560	13277	930
Birch	20686	14812	7403	465
Alder, Lime	12512	8938	4339	230
Aspen	4086	3064	1534	115Fee Rate II (10-15 km)
Pine	37538	26812	13536	930
Fir	33710	24261	12001	930
Birch	18898	13536	6638	465
Alder, Lime	11236	8173	4086	230
Aspen	3828	2811	1276	115Fee Rate III (25-40 km)
Pine	31922	22726	11490	930
Fir	28600	20427	10214	695
Birch	15834	11490	5616	465
Alder, Lime	9449	6897	3322	230
Aspen	3064	2299	1023	95

Assuming that the highest timber values apply to the fee rate I locations for large trees, the stumpage fee is below the timber value for a range of the trees. Pine of the top class has a fee of 41,366 rubles per cubic meter and a timber value of 40,800 which makes the fee in excess of the timber value. But for fir it is below the timber value and for the broad-leaved trees it is below the timber value. A more detailed comparison of fees and timber values is difficult to make from the limited data available but the method is clear from the above. It is also interesting to note that, in 1995, broad-leaved cutting was the main timber extraction, where the fee rates are well below the timber values, at least for the top classes of timber.

5.3.2.2 Illegal wood commerce

It is very difficult to provide exact accounts for illegal wood commerce. Currently there are two system of prices for timber within the Danilovsk okrug. One is based on the officially registered sales prices within the forest monopoly organizations, the other is based on the prices for the illegal market. The illegal prices are based on trade in illegal cuttings and are generally lower than the official prices. There is insufficient state control to prevent the practice of illegal cutting. According to an expert preliminary evaluation, 30 percent of forest is cut illegally and free of charge. The best estimate of the net value of illegal cuttings (i.e. gross value less cost of cutting) is 40,000 rubles per cubic meter.

5.3.2.3 Timber for households

The monetary evaluation for timber to be used in a household is based on the uses of the wood (mainly for heating, construction and repair). Under the current economic situation, with its sharp agricultural decline, the amount of illegal household cutting has increased lately. It is one of few ways for the village residents to make a living.

Some preliminary calculations have been made of the value of such timber in the household sector. These are detailed below:

According to a survey of household use of timber, the annual average needs are for 2.7 m^3 for commercial wood and 14.6 m^3 for firewood. The market prices of the two types of wood are given in Table 5.7 below, as are the total values of the cuttings: 459,000 rubles for commercial wood and 584,000 rubles for firewood.

Table 5.7 Timber Values for Households (on the basis of selling prices as of 1 October 1996)

Timber	**Selling price at the gate Thousand rubles/m^3**	**Consumption m^3/year**	**Value - Thousands rubles/Year**
Commercial	170.0	2.7	459.0
Firewood	40.0	14.6	584.0

The timber processing costs are based on the amount of time required for harvesting, valued at 40 percent of the average wages. Under the survey it was identified that on average each household spent 7.6 person-days on timber processing. The average wage in the Danilovsk municipal okrug in December 1996 was 608,000 rubles per month. This minus the expenses of timber collection amount to about 84,000 rubles per year.

In this way, the direct monetary evaluation for the commercial timber used in the household under the current commercial prices makes 459.0-84.0 = 375.0 thousand rubles per year. Based on the annual need in the household of 2.7 m^3 per year, the monetary valuation of one cubic meter of commercial timber is 375.0/2.7 = 139.0 thousand rubles. These results indicate the high benefits for the village residents under the current individual harvesting and the private sale of wood.

The net value of household use of logs (firewood) is also based on the commercial value. This is in turn based on the sales price of the Danilovsk Timber Plant and the average use of logs for a household. As with timber processing the firewood processing expenses are calculated on the amount of time required for harvesting, valued at 40 percent of the average wages. The survey estimated that average household spends 20.2 person-days on firewood collection etc. for an annual need of 14.6 m^3. The average wages in the Danilovsk municipal okrug in December 1996 were 608 thousand rubles per month. Hence the expenses amount to 223.3 thousand rubles per year. This figure should be subtracted from the value of the firewood (584,000 rubles) to make a net value of 360,700 rubles *per annum.* The corresponding value per cubic meter is 360,700/14.6, or 24,700 rubles.

The above figure can be compared with the costs of firewood logs of birch and aspen sold to households. These have a price of 465 rubles per cubic meter for birch and 115 rubles per cubic meter for aspen. The big differences between these prices and the prices given in Table 5.8 are partly explained by the fact that this wood is targeted at poor households and is limited in supply. On the other hand it does suggest, given the enormous level of subsidy, that these prices could be raised.

Alternative method of valuation of household timber
An alternative method of valuing household timber is in terms of its energy value. The energy is estimated by comparing it to a similar amount of commercial energy (oil or gas). From the obtained value the harvesting expenses are deducted (identified by the method of direct monetary evaluation, at the level of 223.3 thousand R per year).

Based on the average annual need in logs for a household (14.6 m3 /year), taking into account the heat ratio of logs and oil (about 1/10.5) and oil density (0.8 tonnes/m^3) we may identify the equivalent need in oil for a household as:

(14.6 / 10.5) x 0.8 = 1.1 (tons/year).

In this way, The annual energy need for a household is estimated as 1.1 tonnes of oil. Under the oil price at the level of 500,000 per ton, the annual need amounts to 550,000 rubles. After we extract the harvesting expenses (223.3 thousand rubles/year) we obtain the value of timber logs of 326.7 thousand rubles/year or 22.4 thousand rubles/m^3.

Interestingly this method of valuation ends up with a figure for timber logs that is similar to that obtained from the market data on timber prices, less the costs of collection (24.7 thousand rubles/m^3).

5.3.2.4. Conclusion of forest resource valuation
The results obtained for forest resource valuation are given in Table 5.8.

Table 5.8 Initial Results of the Forest Monetary Evaluation (thousand rubles/m^3)

Sector/application	Timber	Log-timber
Household	139.0	22.4- 24.7
Legal commerce	Coniferous: 10,200 - 40,800 Broad-leaved: 900 - 20,700	
Illegal	40.0	

5.3.2.5 Total Valuation of forests in DMO

In this section we apply these values to the amounts cut to obtain an overall estimate of the value of forest resources used in DMO. As with the water resources, however, we report the net government income from the forest sector (the 'direct monetary method') as well as the value of forest resources used, based on the value to the end-users (the WTP method as summarized in Table 5.8). Table 5.9 summarizes the tax collections from forest resources in DMO.

Table 5.9 Taxes Collected in DMO from Forest Timber Extraction

Type of timber	**Volume of consumption Thousand m^3/year**	**Average Tax Collected Thousand rubles/m^3**	**Total Collection Million rubles/m^3**
			Taxes from Forestry Industrial Complex
Commercial Timber	14.6	16.25	237.25
Firewood	13.1	6.65	87.12
Total	27.7		324.37
			Taxes from Inter-industry Forestry Enterprise
Commercial Timber	.35	33.6	14.80
Firewood	10.9	6.65	72.49
Total	11.25		87.29
Grand Total	38.95		411.16

The amounts on which taxes were levied in each of the enterprises is not the same as the amounts cut. The latter is greater, because of wastage. Of the total about 64 million rubles of the tax income went to DMO.

Table 5.10 gives the estimated value of timber based on the summary figures of Table 5.8. The net values are considerable and much higher than the amount collected in taxes, even without valuing the commercial use of timber. Tax revenues amounted to about 412 million rubles. Even if we replace the net values of commercial timber by the taxes (to get a lower bound) the net value of the timber resources used would be 2.2 billion plus 252 million, making a total of 2.45 billion. The actual amounts collected in taxes is then only, 412/2520 = 16 percent of the net value.

Table 5.10 Value of Timber Extracted in DMO Based on End-use Values

Type of timber	**Consumption Volume Thousand m^3/year**	**Net Values rubles/m^3**	**Total Values Million rubles/m^3**
Traded Commercial Timber			
Coniferous	N/A.	10,200 - 40,800	N/A.
Deciduous	N/A.	900 - 20,700	N/A.
Commercial Firewood	24.00	23,550	565.2
Illegal Cutting	0.80	40,000	31.9
Household consumption			
Commercial Type Use	6.45	139,000	896.7
Firewood Use	30.00	23,550	706.5
Grand Total	61.25		2200.3

Notes:
The net value of end use of firewood is taken as the average of the two estimates given in Table 5.8
No details are available of how the illegal cutting estimate was arrived at. It should be noted that a good part of the household

use is also illegally cut

This study has produced some important estimates of the value of forest resources. These need further work, which will be continued as part of the extension of this study. The policy focus has to be on how to prevent illegal cutting and to capture some of the use values that have been estimated. Some contribution to forest management as payment in kind for the use of resources may be one solution in a time of low money incomes.

5.4 Recreational Resources

5.4.1 Introduction

Natural reserves hold a very important place within Yaroslavl oblast. These are the territories under the local administration control, with strict environmental protection. The ultimate goal is to create reforestation and regeneration of natural resources, to regulate and compensate the different ecosystem distortions, and to maintain the environmental balance and the favorable environment for the people.

Decision #118, taken by The Small Council of the Regional Council of the People Deputies on 27 May 1993, "On specially protected natural resources for Novgorod region" approved the list for specially protected territories and sites, including Gorushka-Nature Park.

The specially protected areas for Yaroslavl Oblast are the part of the Darwin Natural Conservation area, historic national park "Ozero Plesheevo", and include 37 zakazniks, and 376 natural monuments (picturesque natural site under protection). As of 01.01.97 these territories amounted to 456.0 thousand Hectare (12.5 percent of all the land area of the region).

Following this decision the organizations in charge of the protected area were approved. Currently, due to the mass privatization which is ignoring environmental protection for the region and villages, most of these conservation sites appear to be 'privatized' -- i.e. assigned under different private enterprises and with no legal status of their own. The enterprises responsible for them do not have enough funds or a desire to support the sites under their ownership.

In this way, the existing mechanism of supporting (fund allocation for maintenance and operation) the specially protected conservation areas has been destroyed. It is very important to re-establish these mechanisms for their protection under a new market system.

The park "Gorushka" has been chosen for this pilot study of the value of recreational resources in Yaroslavl Oblast.

5.4.2 Brief Description

Park "Gorushka" is located in the South-west of Danilov town, on an area of 122 hectares of high value forest land. The park is over 100 years old. The forest species are mainly coniferous. There are 5 separate land plots. The total standing volume makes 200 m^3/hectare. The Danilovsk Forest Plant (Lesokombinat) is in charge of the resolutions and the special status of use, approved by the Decision of the Small Council for Regional Council of Peoples Deputies.

In the opinion of the professional architect (Tauurit), "Gorushka" Park contributes to a better micro-climatic environment for Danilov town. Due to the elevated position of the forest land it accumulates cool air at night below the river Pelenga. It attracts cold air and further transports it into the city providing an air exchange and natural air cleaning.

At present the town construction has moved very close to the forest thus limiting the natural air circulation.

5.4.3 'Total Economic Value' of the Site

The general economic value of this site may be estimated through a number of indicators in conformity with the concept of total economic value (TEV). The two most important are use value (direct and indirect) and existence value.

5.4.3.1 Direct use value

The direct use value is composed of the value of resources and the services they provide. Presently the total (coniferous) standing volume makes:

200 m^3/hectare x 122 hectare = 24,400 m^3 .

Assuming that the value of coniferous commercial timber is 41.3 thousand rubles/ m^3, the direct value will make around 1007.7 million rubles ($76,800 at the exchange rate of 5,700 rubles to the dollar).

At the same time, in accordance with the environmental regime, cutting within the Park is prohibited except for maintenance and sanitary purposes. The logs from such cuttings are considered fuel and timber logs. The average price for one cubic meter of logs in 1996 was 930 rubles. In this way, the maintenance/sanitary cut logs yield 10m^3 per hectare and the total value of the sold log timber amounts to 1.1 million. rubles or $0.2 thousand. The mushrooms and berries are of some value too, but they are very small. All recreational activities are free of charge and are valued separately below.

Thus, the timber resources (log timber) of "Gorushka" are small (1.1 million rubles), and, as will be seen from this analysis, are insignificant compared to the recreational use. There are no other significant use values. The obtained results show that the direct cost evaluation for "Gorushka" will not be helpful to get the real significance value for Danilov and to provide the mechanisms of maintenance and protection for this site.

5.4.3.2 Indirect use value

The indirect use values of the Park "Gorushka" are the following:

carbon sequestration
recreational use

Carbon sequestration

It is assumed that the forest has the capacity to absorb 20-25 tons of carbon dioxide per hectare or 5-5.5 ton of carbon per hectare. Valuing the carbon sequestered at $10 per ton (see IPCC, 1996), which is a lower bound of the values from a large number of studies, gives a value of $50 per hectare. For the whole park this amounts to 34.8 million rubles or $6.1 thousand.

Recreational use

The indirect economic advantage of the recreational use of the park has been estimated conservatively as the value of the time spent in the park, with the value of time taken as can be obtained by health preservation during the rest time. Many of the residents spend their free time around the park. The annual number of visitors to the park was about 160,000 person/day (adjusted for time spent in the park). The average daily wage for Danilovsk okrug in December 1996 was 27,600 rubles (608,000 per month). Hence the time based value of the recreational use of the park is:

27,600*160,000 = 4.4 billion rubles, or $772,000

Use Value as estimated by the hedonic method
Hedonic pricing (HP) is based on the idea that the value of environmental quality can be estimated from expenditures in related markets, particularly the real estate market. If people near the Gorushka site pay more for the houses and land than for locations further away, after allowance has been made for all other factors such as size of dwelling etc., then the price difference is attributable to the environmental factors.

Some research was undertaken on the real estate market in Danilov city, with the support of a local specialist in real estate management, city administrative territories managers and based on the conversation with citizens. Although this initial survey of the market revealed that there were some price differences, and the method had some potential, it is not possible to apply it at the present time. The main reasons are as follows:

the real estate market is still under development process and is not active enough and does not provide enough reliable date yet;
a few cases of comparison of real estate units which have the same characteristics but located at the different distance from Gorushka showed that the ecological component of people's assessments are quite insignificant. The main factors which citizens are focused on are: availability of public transportation and quality of the neighborhood's infrastructure;
documents concerning the trade in dwelling units are not reliable.

5.4.3.3 Existence (non-use) values as estimated by the contingent valuation method
Ideally one should estimate the use and non-use values separately. It is extremely difficult, however, to elicit a non-use value independently of use values when the residents are so close to the park. In this study the contingent valuation method has been used to elicit the benefits of the park in terms of protecting and saving it and not for visiting it. It is not clear from the information provided whether this separation between use and non-use has in fact been achieved. For the purposes of this report we assume that the contingent valuation method has successfully estimated the non-use value of the park.

A survey was carried out on the importance of Gorushka. Respondents were questioned about the forest and the adjacent area by being shown photographs. The survey revealed the great importance of this park for the citizens, namely:

43 percent regarded it as extremely imported for them ;
49 percent regarded it as important;
9 percent were indifferent to the existence of the site.

The importance of Gorushka as a recreation, cultural and heritage place is different for citizens who live in different districts. The closer the residents are to the park the higher the value attached to it.

Frequency of visits Gorushka by citizens
The survey found that:

30 percent of people (respondents) visit Gorushka quite often (more than 15 times per year);
40 percent - sometimes (between 1 and 15 times per year);
30 percent - do not visit Gorushka most of these people are old and any long distance walks are too hard for them).

What do the citizens of Danilov prefer to do in their leisure time?
The survey found that:
50 percent of respondents prefer to spent their leisure time outside;
16 percent - inside (watching TV mostly);
14 percent - showed no preferences (the choice depended of the season: in winter - inside; in summer - outside)
19 percent - have no leisure time at all (they are always busy with housing or earning money for living).

How well are people informed about the situation on Gorushka?
The survey found that 60 percent are well informed about the ecological state of the site. The main source of information was local newspaper. The information about Gorushka in people's minds is closely connected to publications concerning the cathedral that testify to the special spiritual significance of the site.

Willingness to pay for saving and maintaining Gorushka by the contingent valuation method. To estimate the best mechanism for the of the maintenance Gorushka site and to allow for the possibility that citizens could participate in this activity, they were asked to state their willingness to pay and the form of payment (in money or by donating their own labor. In the survey:

81 percent of respondents gave positive response, i.e. had a positive WTP in some form;
19 percent refused to pay in money or to participate in any kind of activities to maintain and protect the park.

The main reason why people refuse to contribute to that activity are as follows:

68 percent have no possibility to make any monetary contribution or they are in bad health;
22 percent stated that they never visited "Gorushka", they were mostly citizens from zone 'III' -- quite far from the park
10 percent stated that they did not want to participate in any projects of this kind.

Thus we can conclude that there is quite a high level of willingness of Danilov's citizens to participate directly in saving Gorushka site as a feature of nature, as a location of the cathedral and as a recreation site for everyone to use. Below is the analysis of the results obtained in terms of money form and by means of replacement/substitute (labor)

The willingness to pay in money was not significant and amounted to about 2,700 rubles/year/.person. Such a low WTP is explained by the hard social-economic situation in Danilov. Aggregating this per capita WTP over the population of Danilov of 18.700 gives a total figure of about 50.5 million rubles *per annum*, that is equal to $8,900.

The WTP in kind was much higher. The average amount of time individuals were willing to devote for protection and maintenance purposes was about 1.3 days/year per person. Taking into consideration daily income for the Danilov population was about 7,900 rubles, the WTP in labor can be estimated as 10,270 rubles/year/person. As the total population of Danilov is 18,700 people, the WTP in kind is about 192.1 million rubles per year or $33.7 thousand.

Adding the two forma of WTP we obtain the figure of 242.6 million rubles or $42,600 per year for maintaining and protecting Gorushka.

Thus, the existence value of Gorushka site (based on willingness to pay for the site existence and maintenance and availability of the use for leisure time) was estimated as 242.6 million rubles ($42,600) per year. It is necessary to emphasize that this estimation includes WTP in terms of labor in the amount of 1-2 days per year per capita under the condition of high quality work management.

5.4.4 Conclusions and Recommendations

This initial attempt to value recreation resources has shown that there are significant values to a park, especially when it has cultural significance and when it is located close to a town (both of which apply to "Gorushka". The main results to note are:

The use values are large and much more than the likely gains from allowing the park to be exploited for its forest resources. In the case of "Gorushka" the use values were: 4.4 billion rubles for recreational use, 34.8 million rubles for carbon sequestration and 1.1 million rubles for timber collection.

The existence value based on WPT is approximately 242 million rubles per annum, but part has to be paid in kind, not in money. This is significant and more than, for example the direct benefit from clear felling the forest, which would only provide approximately one billion rubles as one payment per rotation period of over 30 years.

There are two components of non-use value (in terms of money and labor) because of the complicated social-economic situation of the town. That means that Gorushka is not only important for Danilov citizens, but that they wish to contribute in an active way in the revival of the town ants main recreational area.

The fund could be set up to receive the payments for use (differentiated by area of town) and to support the labor support which will have to organized through a public service commission under Danilov forestry facility (which is responsible for Gorushka site in accordance with Decision of Small Council of People Deputies dated 27 \may 1993 ,N118 "About especially protected zones of Yaroslavl oblast");

5.5 Conclusions on Monetary Valuation of Natural Resources

This section has reported on the values to be attached to some of the key natural resources of Yaroslavl oblast. In order to keep the exercise manageable we have looked at one okrug in the oblast -- Danilov. We have valued the use of water, forests, and recreational resources.

The exercise must be seen as preliminary. Nevertheless, it has resulted in a number of interesting findings. One is that valuations are possible in money terms for most of the services provided by these resources; it may need more effort than could be put into this study but the work has started. The second is that the valuations have some important policy implications. In most cases they point to the scope of taxation of the resources in an efficient and equitable way. Some resources are undertaxed. In the present economic circumstances it may not be possible to raise the taxes without causing hardship, but with some care more taxes can be raised and increased hardship avoided. We have made a number of suggestions as to how this might be done. One is to make people contribute in kind for resources used. Another is to allow poor households access to limited amount of the resource with little or no payment and to raise the tax rates according to affordability. As the economy develops, so will the ability to pay for these resources in money terms. The danger is that in the *interim*, the resource base will get degraded. It is important therefore to find ways of paying for the adequate protection of the natural

capital of the oblast during this difficult time. This makes it all the more important to raise the necessary finance and human resources and to exploit the opportunities shown in this analysis.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

In compliance with an Agreement on Monetary Valuation of Natural Resources, signed by the Yaroslavl Oblast Government, the Yaroslavl Cadaster Center and the Harvard Institute for International Development (HIID), in the framework of an USAID project, have initiated work on designing a market-oriented and UN-compatible natural resources monetary valuation system (as an essential and integral part of the natural resources taxation reform) and preparing recommendations for natural resource tax reform.

In the course of the project: (1) an analysis of current practices in natural resource accounting and valuation in Yaroslavl Oblast was made and (2) natural resources monetary valuation of water resources, forests, and forest recreation capacity was carried out in one of the Oblast's municipal districts (okrugs).

The results obtained help make policy conclusions for natural resource management purposes (starting with the municipal level) and on major directions of further work. In addition, the findings enable us to make early suggestions on improvement of natural resources taxation, which has interest for other regions as well (for instance, in the process of building up the fundamentals of community management, implementing municipal reforms, improving forest management, etc.). Given below are given major conclusions arrived at for natural resources considered in the course of the project activity.

6.2 Water Resources

Water value, especially in rural areas and small towns of Russia, is underestimated and differs significantly from value levels in many developed market economies. This situation was shaped by decades-long command-control economy practices that led to a taxation system largely ignoring rational environmental management. In addition, it resulted from traditional community attitudes to water. The latter point is essential, since the instilled human attitude of considering water as a free asset will impede implementation of the municipal reform in Russia. In the circumstances, municipal reform may take longer time and will require a differentiated approach with due account of human willingness to pay.

There are significant differences in values of water used for domestic needs between towns and villages. Urban settlements are in between them. In the circumstances, three relevant kinds of approaches to the differentiation of tax policies should be considered.

To improve domestic water supply for Russian small towns under the current situation of “low level equilibrium”, special attention should be given to developing a mechanism of water supply financing which would envisage a return of expenditures incurred and credits provided. This mechanism may initially provide for:

an increase (no more than twofold) of water use tariffs coupled with improved water supply and drinking water quality, as well as envisaging differential income related subsidies that would gradually be phased out;

changes in the mechanism of subsidized financing for municipal services. In a number of countries it has been found effective to apply targeted credits (or subsidies) to residents of settlements to help them be linked to water mains. These linkage charges cover repair and maintenance costs of water mains

and improvements in water quality (India, Philippines). In this way, it was possible to enhance water users' control over water services provided and funds;

consideration of increasing a range of payable services (for example, installation and operation of additional individual water treatment devices). Opinion surveys conducted in Yaroslavl Oblast revealed that this type of services will be in demand among wealthier residents in towns;

economic feasibility studies of selling top quality drinking water in towns as a nutrition product, with subsidized funding out of the city budget instead of trying to upgrade tap water in the centralized way.

In urban type settlements under the current conditions (joint stock privatization of enterprises, deprivation of population, etc.), the old water supply system is practically destroyed. Currently, communal household municipal services are not able to maintain the existing water mains system with the current low rates for energy use and water use tariffs. It is necessary to introduce new tariffs. It is very essential to identify settlements where water supply networks can economically be maintained in the coming decade as well as settlements where a shift to traditional sources of water supply is economically justifiable. *It is of critical importance to revive and maintain traditional water sources in villages in order to avoid local water supply crises.*

To improve water supply in villages it would be expedient to concentrate on *the maintenance of existing water sources.* With this in view, it may be necessary to:

increase water use charges and to target revenues collected on solving problems of household water supply in villages. Special attention should be given to exploring the possibility of raising water charges for summer time country-side inhabitants ("dachniki") who do not stay there for winter and developing a system of incentives for local full time residents;

consider the revival of earlier practice of voluntarily agreed charges to create funds to be managed by local authorities and aimed at covering water source maintenance expenses;.

in addition, land privatization or leasehold arrangements should necessarily take into account access to water sources (including servitude issues).

Taking into account the great distinctions between rural and city water supply, in developing water programs and communal reform planning it is necessary to carry out similar surveys on water supply, the relation of property rights in this sphere, and the monetary valuation of water (including indirect, subjective, based on willingness to pay).

6.3 Forest Resources

Monetary values of forests in the surveyed municipal district are at present considerably underestimated. To a great extent, it can be explained by the severe decline in living standards, increased tariffs for transportation, and, consequently, by the dwindling purchasing power of the local population and declining demand for forests and deciduous trees.

Russian regions feature two pricing systems for timber. One is based on officially established timber selling price rates for monopolist logging companies, and the other is based on prices in the illegal market.

Illegal market prices are shaped by easy availability of forests as a resource at low prices (poor population take advantage of special low selling prices) along with declined forest protection control by state. Preliminary expert assessment indicates that up to 20 percent of forests is cut down free of charge.

Increased forest logging is fuelled by a sharp decline in living conditions of rural population and by benefits (as was indicated above) of private forest sales, especially coniferous trees. At the same time, the total amount of logging is much lower than maximum permitted levels that would cause forest depletion. There are many overmature trees. In addition, current logging practices under the present economic conditions (that lead to cutting mainly coniferous trees) result in worsened forest structure in which low value deciduous trees prevail.

The monetary valuation has shown that there is a need to develop a special program to deal with the present crisis in the Oblast's forest management. Conventional costing approaches or attempts to tighten administrative control do not work for the present conditions in the Yaroslavl Blast.

In the situation where the majority of forests is of low quality, direct subsidies to enhance reforestation will be of little significance since they do not increase the purchasing power and attending demand for forests (timber) and do not remove basic causes of the present crisis. Raising demand for forests through increasing the population's purchasing power is a key factor in resolving the present forestry crisis.

In the current situation state support may be effective for promoting deeper timber processing in the Northeast of the Oblast. A special emphasis can be made on the introduction of plywood production that is in demand on the world market. Such an approach would stimulate demand for deciduous trees, on the one hand, and would provide employment for more than one thousand people, on the other. The experience of other Russian regions (Kostroma and Perm oblasts, Khabarovsky krai) shows that the promotion of deeper timber processing (for example, plywood production) in the north-east of Yaroslavl oblast within an *effective territorial management policy* would produce a multiple effect. It would contribute to improved forest management and would help find funds for reforestation and social needs. Therefore, from the very beginning, the introduction of improved timber processing should meet the goals of sustainable development for the north-eastern area of Yaroslavl oblast which would require that the local government and local administration have, at least at an early stage, a controlling interest in these operations. Now that underestimated forest values stimulate the 'cowboy economics' approach to nature exploitation, it is essential to check further forest wanton logging. An effective state control would bring additional finances for reforestation and then provide conditions for developing a forest market.

Another policy worthy of note is the combination of social security measures for rural population with those for forest conservation. For example, in Costa-Rica, during the crisis in the late 1990s, subsidies were channeled to those rural residents who were ready to give up illegal forest cutting. That approach may not have significantly improved the situation but reduced human pressure on forests adjacent to villages. Noticeable positive effects were not obtained until the 1980s, when living standards considerably increased.

6.4 Recreational Resources

A pine-tree grove adjacent to one of small towns and a favorable rest place for town residents was selected as a recreation site for valuation. The following conclusions were made:

Even under the current difficult conditions in Russia it is possible to make monetary valuation of recreation resources, including the use of contingent valuation methods.

In the course of the valuation activity, two components of existence values of natural resources (the

willingness to pay in monetary terms and in kind as labor inputs) were identified, reflecting the difficult socio-economic situation. The results obtained reveal not only an active position of local people with regard to protecting recreation sites, but also indicate ways to design a mechanism for practical work that would include:

a subfund as part of environmental funds at the municipal level;
introduction of a special targeted fee, individually set (in our case around 3,000 rubles per person per year) or make this fee as a separate item within the general structure of a unified communal fee. The amount may vary depending on proximity to the recreation facility;
allocation of revenues not so much for the direct financing of forest service activities but, rather, for stimulating and organizing voluntary labor inputs by local residents living next to the recreation site;
introduction of openness and public participation in setting up and using the fund as well as the establishment of an supervisory committee made up of the most respected citizens;
organization of permanent public information activities to highlight the importance and significance of the recreation site for local residents and to advertise practical result of voluntary activities.

6.5 General Conclusions

The first findings of the monetary valuation exercise have revealed the necessity of increasing the share of natural resource-related charges in municipal budgets. In the mean time one can notice a reverse process underway lately, which makes municipal districts more subsidy dependent. This trend, on the one hand, increases the political dependence of local authorities on the regional (Oblast) administration and, on the other hand, the latter becomes less interested in dealing with accounting and valuation of natural resources on their territories.

In general, the project has made it clear that valuing natural resources in the current conditions in Russia is necessary not only for taxation improvement in various Russian regions, but is practically implementable. Such activity should begin from the bottom at the municipal level. Only after reliable basic data is obtained on the supply and values of natural resources will it be possible to proceed to regional and federal level analyses. Moreover, monetary valuation could become an essential stage for creation of an internationally compatible system of integrated economic and environmental accounting at the level of subjects of the Russian Federation and on the federal level as well.

Abbreviations Used in this Report

DMO—Danilovsky Municipal Okrug
HIID—Harvard Institute for International Development
NP—net price
PV—present value
SEEA—system of environmental economic accounting
SFS—State Forestry Service

TEV—total economic value
UC—user cost
USAID—United States Agency for International Development
WSS—water supply systems
WTP—willingness to pay

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